Middlesex Community College

Elementary Algebra

Student Workbook

Version 2

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Cover Designed By

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About this Workbook

This workbook was originally created by mathematics instructors at Scottsdale Community College in Scottsdale, Arizona. Jennifer Nohai-Seaman edited their version to fit the needs of the students and professors at Housatonic Community College. Pam Frost edited that version to fit the Connecticut's Elementary Algebra common learning outcomes and needs at Middlesex Community College. This book is designed to lead students through Elementary Algebra, and to help them develop a deep understanding of the concepts. Special thanks to the Developmental Studies Department at Housatonic Community College and the math faculty that piloted these materials at Middlesex Community College for their valuable and immeasurable input. Each Unit includes the following components:

VIDEO LESSON

- The Video Lesson is the main instructional component for each Unit. Q1 video www.MyOpenMath.com is paired with each section 1 of each unit, Q2 video on www.MyOpenMath.com with section 2, and so on.
- Ideas are introduced with practical applications.
- **Example** problems are to be completed by watching online videos and taking notes/writing down the problem as written by the instructor. Video links can be found on www.MyOpenMath.com which serves as the online homework system.
- **You Try** problems help reinforce Video Lesson concepts and should be worked in the order they appear, showing as much work as possible.

PRACTICE PROBLEMS

- This section follows the Video Lesson. For each Unit, the Practice Problems include Skills Practice, and Applications.
- Your instructor will provide information on accessing answers/solutions for these problems.

UNIT REVIEW

- Unit Reviews are meant to test your understanding of the concepts of the Unit.
- Complete the Review without the use of the workbook or your notes and then look back through the Unit to check your answers.

ONLINE HOMEWORK/ASSESSMENT

- These materials are part of a formal class and your class utilizes www.MyOpenMath.com as their homework/assessment system, your instructor will provide information as to how to access and use that system in conjunction with this workbook.

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Arithmetic Review

Arithmetic Review: Notes

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Section R1: Order of Operations

PEMDAS

If we are working with a mathematical expression that contains more than one operation, then we need to understand how to simplify. The acronym ***PEMDAS*** stands for *P*arentheses, *E*xponents, *M*ultiplication, *D*ivision, *A*ddition, *S*ubtraction.

P	Terms inside parenthesis ( ) or brackets [ ]
E	Exponents and roots
MD	Multiplication and division (**from Left to Right**).
AS	Addition and subtraction (**from Left to Right**).

**Use the order of operations to evaluate each of the following expressions.
Use your calculator to check your answers.**

Example 1: $(2 \cdot 5)^2$ $2 \cdot 5^2$

$10 - 7 + 1$ $10 - (7 + 1)$

Example 2: $24 \div (4 - 2)^3$

Example 3: $4 + 5(1 + 12 \div 6)^2$

Example 4: $\frac{15-3}{1+5}$

Section R1: You Try

Use the order of operations to evaluate each of the following expressions. Show all steps as in the media examples. Use your calculator to check your answers.

a. $11 + 3(7 - 2)^2$

b. $\frac{6+8}{4-2}$

Section R2: Fractions

Improper Fractions and Mixed Numbers

Converting a mixed number to an improper fraction:

1. Multiply the denominator and the whole number
2. Add the numerator
3. Write the result over the denominator

Example 1: Express as an improper fraction.

$3\frac{2}{7}$ $12\frac{1}{3}$

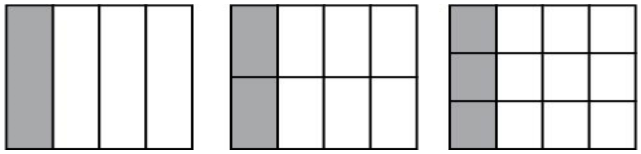
Converting an improper fraction to a mixed number:

1. Divide the numerator by the denominator
2. The quotient becomes the whole number part of the mixed number
3. Write the remainder over the denominator

Example 2: Express an improper fraction as a mixed number.

$\frac{42}{5}$ $\frac{53}{9}$

Equivalent Fractions



Example 3: Find two fractions equivalent to $\frac{2}{7}$.

Fractions in Simplest Form

Example 4: Write the following fractions in simplest form.

$\frac{3}{18}$ $\frac{42}{54}$

ONE and ZERO

Example 5: $\frac{1}{4} =$ $\frac{4}{1} =$

$\frac{4}{4} =$ $\frac{0}{4} =$

$\frac{4}{0} =$

Section R2 – YOU TRY

Complete the problems below. Show all steps as in the media examples.

a. Reduce the fraction $\frac{24}{36}$ to lowest terms.

b. Rewrite the mixed number $4\frac{1}{5}$ as an improper fraction.

c. Rewrite the improper fraction $\frac{35}{11}$ as a mixed number.

d. Find two fractions equivalent to $\frac{3}{5}$.

Section R3: Operations on Fractions

Addition and Subtraction of Fractions

<u>Adding and Subtracting Fractions</u>:

1. Rewrite mixed numbers and whole numbers as improper fractions.
2. Find a common denominator
3. Rewrite the fractions as equivalent fractions with the common denominator
4. Add or subtract the numerators
5. Be sure to reduce your answer to simplest form!

Example 1: Perform the indicated operations

a. $\frac{1}{2}+\frac{1}{3}$

b. $\frac{11}{15}-\frac{5}{12}$

c. $4\frac{3}{5}-1\frac{5}{6}$

d. $2-\frac{8}{5}$

Multiplication and Division of Fractions

Multiplying Fractions:

1. Rewrite mixed numbers and whole numbers as improper fractions.
2. Multiply straight across (Multiply the numerators with the numerators, and the denominators with the denominators) NOTE: There is no need to find a common denominator when multiplying.
3. Be sure to reduce your answer to simplest form!

Example 2: Multiply. Write your answers in simplest form

a. $\frac{2}{3} \times \frac{3}{4}$

b. $\frac{12}{25} \times \frac{35}{48}$

c. $\frac{7}{8} \times 5$

d. $3\frac{1}{5} \times 1\frac{1}{9}$

Dividing Fractions:

1. Rewrite mixed numbers and whole numbers as improper fractions.
   NOTE: There is no need to find a common denominator when dividing.
2. Change the **second** fraction (the divisor) to its reciprocal
3. Multiply
4. Be sure to reduce your answer to simplest form!

Example 3: Divide. Write your answers in simplest form.

a. $\frac{1}{2} \div \frac{3}{5}$

b. $8 \div \frac{4}{5}$

Order of Operations with Fractions

Example 4: Perform the indicated operations. $\frac{1}{2}+\frac{3}{2}\times\frac{2}{5}$

Section R3 – You Try

Perform the indicated operations. Show all steps as in the media examples. Each answer must be written as a **reduced** fraction. Where appropriate, write your answer as **both** a mixed number **and** an improper fraction.

a. $\frac{3}{5}+\frac{2}{3}$

b. $\frac{3}{5}\left(\frac{2}{3}\right)$

c. $\frac{3}{5}\div\frac{2}{3}$

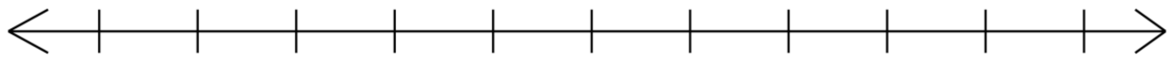
d. $3-\frac{12}{5}$

e. $\frac{3}{7}\div 5$

f. $\frac{3}{4}\div\frac{4}{5}\times\frac{5}{6}$

Section R4: Signed Numbers

The Number Line



Absolute Value

The ABSOLUTE VALUE of a number is the distance that number is from 0 on the number line.

Example 1: Find the absolute value:

a. $|-3|$ b. $|3|$ c. $-|-3|$ d. $|0|$

MATHEMATICAL OPERATIONS WITH SIGNED NUMBERS

Some hints for working with signed numbers:

- Use ( ) to separate numbers with negative signs
- When two signs are given together, use these rules to resolve the signs:
  (–)(–) = + (–)(+) = – (+)(–) = – (+)(+) = +
- Use the number line to add and subtract

Example 2: Perform the indicated operations.

a. 3 + (–2) b. –3 + 2 =

c. –3 – (–2) d. –3 + (–2)

Example 3: Multiply and divide.

a. (–5)(–6) b. 3(–4)

c. $\frac{-24}{8}$ d. $\frac{2}{3}\left(-\frac{1}{5}\right)$

Example 4: Evaluate the following exponents:

$(-5)^2$ -5^2

$(-5)^3$ -5^3

Example 5: Perform the indicated operations.

$-8 \div (-2)^3 - (-3) - 5^2$

SIMPLIFIED FORM FOR A SIGNED FRACTION

The following fractions are all equivalent (meaning they have the same value):

$$\frac{-1}{2} = \frac{1}{-2} = -\frac{1}{2}$$

Notice that only the placement of the negative sign is different.

HOWEVER, only the last one, $-\frac{1}{2}$ is considered to be in simplest form.

Section R4 – You Try

Complete the problems below. Show all steps as in the media examples. Use your calculator to check your answers.

a. Find the absolute value: $|-5|=$______ $-|-5|=$______

b. $(-2)^3 - 2^3$

c. $6 + 12 \div 3 \times 4 - (-2) - 4$

Section R5: Applications

Example 1: Mark takes out a $35,000 student loan to pay his expenses while he is in college. After graduation, he will begin making payments of $222.48 per month for the next 20 years to pay off the loan. How much more will Mark end up paying for the loan than the original value of $35,000? Show all of your work. Write your answer in a complete sentence.

Example 2: Eddie earns 95%, 43%, 78%, and 89% on his last 4 tests.

a. What is the average grade for these tests?

b. If he earns a 100% on the last test, is it possible for Eddie to earn a B in the course?

Example 3: An employment agency was able to find jobs for 1400 people out of 2660 people. What simplified fraction shows how many did not find jobs through this agency?

Section R5 – You Try

A t-shirt requires $1\frac{3}{8}$ yards of material. How many t-shirts can be made from $41\frac{1}{4}$ yards of material?

Arithmetic Review: Practice Problems

Skills Practice

1. Evaluate using the correct order of operations. Show all of your work. Use your calculator to check your answer. Write your answers as integers or reduced fractions.
   a. $8 \times 3^2 \times 2 \div 4$
   b. $24 \div (1 + 2)^3$
   c. $20 - (8 - 2) \div 3 \cdot 4$
   d. $10 \times 3^2 + \frac{15-3}{3\times 2}$
   e. $\left(\frac{8+2}{7-2}\right)^2$
   f. $2 + 4 \times 8 - (2 + 3)^2$

2. Express the following fractions as improper fractions. Write your answer in simplest form.
   a. $2\frac{3}{8}$
   b. $-2\frac{3}{4}$
   c. $4\frac{2}{6}$

3. Express the following fractions as mixed numbers. Write your answer in simplest form.
   a. $\frac{43}{8}$
   b. $\frac{38}{12}$
   c. $\frac{70}{6}$

4. For each of the following pairs, circle the **larger** number.

a. $\frac{5}{7}$ $\frac{5}{8}$ b. $\frac{5}{7}$ $\frac{7}{5}$ c. $\frac{5}{7}$ $\frac{6}{7}$

d. $\frac{4}{7}$ $\frac{1}{2}$ e. $\frac{5}{6}$ $\frac{6}{7}$ f. $\frac{1}{7}$ $\frac{7}{1}$

5. Write each of the following in simplest form.

a. $\frac{54}{72}$ b. $\frac{165}{345}$ c. $4\frac{12}{28}$

6. Show each step involved in evaluating each of the following. Write your answers in simplest form.

a. $\frac{1}{6}+\frac{2}{9}$ b. $\frac{5}{8}-\frac{6}{12}$

c. $\frac{1}{3}+\frac{2}{7}$ d. $\frac{8}{9}-\frac{6}{12}$

e. $2\frac{3}{4}+3\frac{4}{5}$ f. $2\frac{2}{5}-1\frac{1}{3}$

7. Evaluate each of the following. Show all steps. Write your answers in simplest form.

a. $\frac{24}{3} \times \frac{27}{8}$

b. $8 \times \frac{3}{24}$

c. $\frac{1}{4} \times \frac{3}{5} \times \frac{2}{9}$

d. $\frac{24}{3} \div \frac{8}{3}$

e. $\frac{3}{5} \div \frac{9}{15}$

f. $2\frac{1}{3} \div 1\frac{1}{2}$

8. Evaluate using the correct order of operations. Show all of your work. Use your graphing calculator to check your answer

a. $(-2)^2 - 2^2$

b. $2(-3)^3 \times 8 \div 4$

c. $-\frac{2}{3} - \frac{8}{3} \times \frac{3}{2}$

d. $\frac{2}{5}\left(-\frac{5}{8}\right)^2$

e. $(-4)^2 - 12 \div 3 \times 9$

f. $\frac{8-(1+3)^2}{4-(-5)}$

Applications

9. Sam takes out a $25,000 student loan to pay his expenses while he is in college. After graduation, he will begin making payments of $167.68 per month for the next 20 years to pay off the loan. How much more will Sam end up paying for the loan than the original value of $25,000? Show all your work. Write your answer in a complete sentence.

10. Abie makes $39,000 a year and spends about $250 each month on entertainment. What fraction of her annual income is spent on entertainment? Show all of your work. Write your answer in a complete sentence.

11. Last year, the daily high temperatures in northern Washington for the first week of January were -8^{o}, -5^{o}, -4^{o}, 0^{o}, 8^{o}, 7^{o}, -5^{o} Fahrenheit. What was the average daily high temperature for that week? Show all your work. Write your answer in a complete sentence.

12. Michelle wants to make cupcakes for her daughter's birthday. The recipe calls for ¾ cup of brown sugar, 1½ cups of white sugar, and 2 cups of powdered sugar, and will make 12 cupcakes. How much sugar will be in each cupcake? Show all your work. Write your answer in a complete sentence.

13. Judy took Jen and Bill to the casino. Bill and Jen each won \$100 playing the nickel slots. To say thanks, Jen gave Judy $1/4^{th}$ of her winnings and Bill gave Judy $1/5^{th}$ of his winnings. Who gave Judy more money? How much more? Show all your work. Write your answer in a complete sentence.

14. Jack and Jill each bought 100 pounds of cashews. Jack divided his cashews into 23 equal amounts and put them in paper bags. Jill divided her cashews into 18 equal amounts and put them in paper bags. To celebrate, each ate a bag of cashews. Now, Jack has 22/23 of his paper bags and Jill has 17/18 of her paper bags. Who has more pounds of cashews left? How many more pounds? Show all your work. Write your answer in a complete sentence.

15. So far this season, a hockey team has won 8 games and lost 4 games. This team has won what fraction of the games that it has played? Show all your work. Write your answer in a complete sentence.

16. Marta earns $12.50 per hour during a 40-hour work week. If she works overtime, she earns time and a half pay for every additional hour that she works. This week, she has worked 46 hours. Determine her pay for this week. Show all your work. Write your answer in a complete sentence.

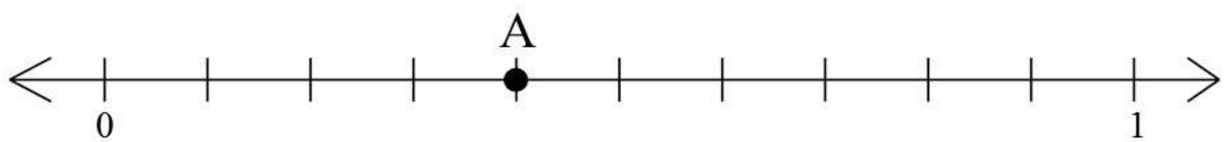
17. At a store, there is a display of 240 boxes of cereal. Of the 240 boxes, 3/5 are brand A and 2/5 are brand B. How many boxes of brand B cereal must be added so that the display has 1/2 of each brand? Show all your work. Write your answer in a complete sentence.

Arithmetic Review

1. Write $2\frac{5}{8}$ as an improper fraction. ______________

2. Write $\frac{29}{3}$ as a mixed number. _____________

3. On the scale below, the letter A represents the fraction _______________



4. For each of the following pairs, circle the **larger** number.

a. $\frac{1}{7}$ $\frac{1}{8}$

b. $\frac{5}{7}$ $\frac{7}{5}$

c. $\frac{5}{7}$ $\frac{6}{7}$

d. $\frac{4}{7}$ $\frac{1}{2}$

e. 1 $\frac{8}{9}$

f. $\frac{16}{3}$ 5

5. Simplify each of the following fractions if possible. Write "DNE" if the answer does not exist.

$\frac{5}{1}$ = __________ $\frac{5}{5}$ = __________ $\frac{5}{15}$ = __________ $\frac{0}{5}$ = __________

6. Perform the indicated operations.

a. $-5 + 3 =$ __________ d. $5 - (-3) =$ __________ g. $(-5)^2 =$ __________

b. $-5 - 3 =$ __________ e. $5(-3) =$ __________ h. $-5^2 =$ __________

c. $-5 + (-3) =$ __________ f. $-5(-3) =$ __________ i. $(-5)^3 =$ __________

7. Add, subtract, multiply and divide as indicated. Each answer must be written as a **reduced** fraction or whole number. Where appropriate, write your answer as **both** an improper fraction **and** a mixed number.

a. $\frac{35}{8}\left(-\frac{12}{5}\right)$ b. $\frac{2}{5} - 3$

c. $6\frac{1}{2} + \left(-\frac{3}{5}\right)$ d. $\frac{3}{5} \div 7$

8. Evaluate using the correct order of operations. Show all your work.

a. $\frac{1}{2} \div \frac{2}{3} \times \frac{3}{4}$ b. $8 + 3(5 - 7)^2$

Unit 1: Introduction to Variables

Unit 1 Notes

Unit 1: Video Lesson

Section 1.1: Writing Algebraic Expressions

Definitions
A **variable**, usually represented by a letter or symbol, can be defined as: • A quantity that may change within the context of a mathematical problem. • A placeholder for a specific value. An **algebraic expression** is a mathematical statement that can contain numbers, variables, and operations (addition, subtraction, multiplication, division, etc…).

Example 1: Juan is 6 inches taller than Niko. Let N represent Niko's height in inches. Write an algebraic expression to represent Juan's height.

Example 2: Juan is 6 inches taller than Niko. Let J represent Juan's height in inches. Write an algebraic expression to represent Niko's height.

Example 3:   Suppose sales tax in your town is currently 9.8%. Write an algebraic expression representing the sales tax for an item that costs D dollars.

Example 4: You started this year with \$362 saved and you continue to save an additional \$30 per month. Write an algebraic expression to represent the total amount saved after *m* months.

Example 5: Movie tickets cost \$8 for adults and \$5.50 for children. Write an algebraic expression to represent the total cost for *A* adults and *C* children to go to a movie.

Section 1.1 – You Try

Complete the following problems. Show all steps as in the media examples.

a. There are about 80 calories in one chocolate chip cookie. If we let *n* be the number of chocolate chip cookies eaten, write an algebraic expression for the number of calories consumed.

b. Brendan recently hired a contractor to do some necessary repair work. The contractor gave a quote of \$450 for materials and supplies plus \$38 an hour for labor. Write an algebraic expression to represent the total cost for the repairs if the contractor works for *h* hours.

c. A concession stand charges \$3.50 for a slice of pizza and \$1.50 for a soda. Write an algebraic expression to represent the total cost for *P* slices of pizza and *S* sodas.

Section 1.2: The Story of "x"

Example 1: Tell the story of x in each of the following expressions.

a. $x - 5$

b. $5 - x$

c. $2x$

d. x^2

Example 2: Tell the story of x in each of the following expressions.

a. $2x + 4$

b. $2(x + 4)$

c. $5(x - 3)^2 - 2$

Example 3: Write an algebraic expression that summarizes the stories below.

a. Step 1: Add 3 to x
Step 2: Divide by 2

b. Step 1: Divide x by 2
Step 2: Add 3

Example 4: Write an algebraic expression that summarizes the story below.

Step 1: Subtract x from 7
Step 2: Raise to the third power
Step 3: Multiply by 3
Step 4: Add 1

Section 1.2 – You Try

Complete the following problems.

a. Tell the story of x in the expression $\frac{x-3}{5}$

b. Write an algebraic expression that summarizes the story below:

Step 1: Multiply x by 2
Step 2: Add 5
Step 3: Raise to the second power.

Section 1.3: Evaluating Algebraic Expressions

Example 1: Find the value of each expression when $w = 2$. Simplify your answers.

$w - 6$ $6 - w$ $5w - 3$

w^3 $3w^2$ $(3w)^2$

$\frac{4}{5w}$ $\frac{5w}{4}$ 3^w

Example 2: Evaluate $ab + c$ given $a = -5$, $b = 7$, and $c = -3$

Example 3: Evaluate $a^2 - b^2$ given $a = -5$ and $b = -3$

Example 4: A local window washing company charges $11.92 for each window plus a reservation fee of $7.

a. Write an algebraic expression to represent the total cost from the window washing company for washing w windows.

b. Use this expression to determine the total cost for washing 17 windows.

Section 1.3 – You Try

Evaluate $b^2 - 4ac$ given $a = 5$, $b = -1$, $c = 2$.

Section 1.4: Applications

Example 1: The maximum heart rate is the highest heart rate achieved during maximal exercise. In general, you get the most benefits and reduce the risks when you exercise within your *target* heart rate zone. Usually this is when your exercise heart rate (pulse) is about 80 percent of your maximum heart rate. The formula $M = 0.8(220 - A)$, gives the *recommended* maximum heart rate, M, in beats per minute, for a person who is A years of age. What is the recommended maximum heart rate for a person who is 40 years old?

Example 2: A golfer strikes a golf ball. The height, H (in feet), of the ball above the ground after t seconds is given by the equation $H = -16t^2 + 80t$. Determine the height of the ball after 3 seconds. Show all of your work, and write your answer in a complete sentence.

Example 3: Simple interest is given by the formula $A = P + Prt$. Where A is the accrued value of the investment after t years, and P is the starting principal invested at an annual percentage rate of r, expressed as a decimal. Sally buys a $1,000 savings bond that pays 4% simple interest each year. How much will the bond be worth after 5 years?

Example 4: The formula $P = 266(1.009)^t$ estimates the population of the United States (in millions of people), t years after 1995.

a. Use this formula to estimate the U.S. population in 1995. Round your answer to the nearest million.

b. Use this formula to estimate the U.S. population in 2016. Round your answer to the nearest million.

Section 1.4 – You Try

Paul is planning to sell bottled water at the local carnival. He buys 2 crates of water (2000 bottles) for \$360 and plans on selling the bottles for \$1.50 each. Paul's profit, P in dollars, from selling b bottles of water is given by the formula $P = 1.5b - 360$. Determine Paul's profit if he sells all 2000 bottles of water. Show all of your work, and write your answer in a complete sentence.

Section 1.5: Geometric Formulas

Example 1: The circumference of a circle with radius *r* is given by the formula $C = 2\pi r$

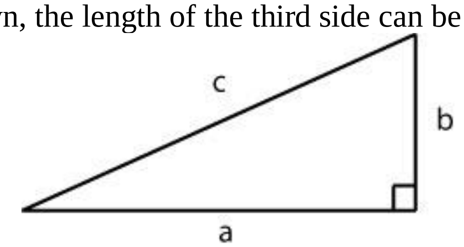
Determine the circumference of a circle with radius 32 cm. Write your answer in **exact form** (in terms of π) *and* in **approximate form**, rounded to the nearest hundredth.

Example 2: The formula for the volume of a cone of base radius *r* and height *h* is

$$V = \frac{1}{3}\pi r^2 h$$

Determine the volume of a cone with base radius 5 inches and height 12 inches. Write your answer in **exact form** (in terms of π) *and* in **approximate form**, rounded to the nearest hundredth.

The Pythagorean Theorem
The Pythagorean Theorem states that given any right triangle with legs *a* and *b*, and hypotenuse *c* as below, the following relationship is always true: $a^2 + b^2 = c^2$. Consequently, if the lengths of two sides are known, the length of the third side can be found using the formulas below:

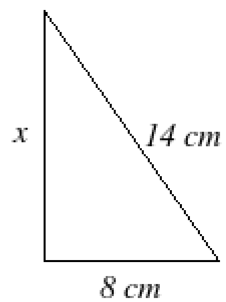


$$a = \sqrt{c^2 - b^2}$$

$$b = \sqrt{c^2 - a^2}$$

$$c = \sqrt{a^2 + b^2}$$

Example 3: Find the length of the leg x of the right triangle shown below. Write your answer in **exact form** *and* in **approximate form**, rounded to the nearest thousandth.

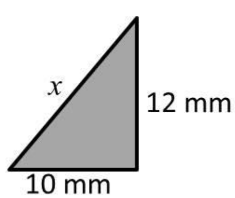


Section 1.5 – You Try

Complete the following problems. Show all steps as in the media examples.

a. The formula for the volume, V, of a cylinder of radius r and height h is $V = \pi r^2 h$. Determine the volume of a cylinder with radius 4 inches and height 10 inches. Write your answer in **exact form** (in terms of π) *and* in **approximate form**, rounded to the nearest hundredth. Include appropriate units in your answer.

b. Use the Pythagorean Theorem to find the length of side x of the right triangle shown below. Write your answer in **exact form** *and* in **approximate form**, rounded to the nearest thousandth.



Unit 1: Practice Problems

Skills Practice

1. Tell the story of x in each of the following expressions.

a. $x - 11$

b. $x + 5$

c. $5x$

d. x^5

e. x^3

f. $2 - x$

g. $2x - 3$

h. $8x^2$

i. $(2x)^2$

j. $7 - 2x$

k. $5(7 - x)^3$

l. $\left(\frac{3x-8}{5}\right)^3$

2. Write an algebraic expression that summarizes the stories below.

a. Step 1: Add 8 to x
Step 2: Raise to the third power

b. Step 1: Divide x by 8
Step 2: Subtract 5

c. Step 1: Subtract 3 from x
Step 2: Multiply by 7

d. Step 1: Multiply x by 10
Step 2: Raise to the 3^{rd} power
Step 3: Multiply by 2

e. Step 1: Add 5 to x
Step 2: Divide by 2
Step 3: Raise to the second power
Step 4: Add 8

f. Step 1: Raise x to the second power
Step 2: Multiply by 5
Step 3: Subtract from 9

g. Step 1: Subtract x from 2
Step 2: Multiply by -8
Step 3: Raise to the third power
Step 4: Add 1
Step 5: Divide by 3

h. Step 1: Multiply x by -1
Step 2: Add 9
Step 3: Divide by 2
Step 4: Raise to the fifth power

3. Find the value of each expression when $b = -8$. Simplify your answers.

a. $b - 11$

b. $b + 5$

c. $5b$

d. b^2

e. b^3

f. $2 - b$

4. Evaluate each of the following given $q = 10$.

a. $2q - 3$

b. $8q^2$

c. $(2q)^2$

d. $\frac{4}{7q}$

e. $7 - 2q$

f. 2^q

5. Find the value of each expression when $c = \frac{2}{3}$. Write your answers as proper fractions or mixed numbers in simplest form.

a. $c - 5$

b. $c + \frac{3}{5}$

c. $\frac{3}{5}c$

d. c^2

e. c^3

f. $\frac{2}{c}$

6. Evaluate the following expressions for the given values. Simplify your answers.

a. $\frac{-b}{2a}$ for $a = 6,\ b = 4$

b. $\frac{4x-8}{5+x}$ for $x = 3$

c. $\frac{3}{5}ab$ for $a = 8, b = 1\frac{2}{3}$

d. $3x^2 + 2x - 1$ for $x = -1$

e. $x^2 - y^2$ for $x = -3, y = -2$

f. $2x - 7y$ for $x = 5, y = 3$

g. $\sqrt{c^2 - a^2}$ for $a = 3, c = 5$

h. $\sqrt{b^2 - 4ac}$ for $a = -1, b = -5, c = 6$

Applications

7. Shea bought C candy bars for $1.50 each.
   a. Write an algebraic expression for the total amount Shea spent.

   b. Use this expression to determine the amount Shea will spend for 3 candy bars. Show all of your work and write your answer in a complete sentence.

8. Suppose sales tax in your town is currently 9%.
   a. Write an algebraic expression representing the sales tax for an item that costs D dollars.

   b. Use this expression to determine the sales tax for an item that costs $354. Show all of your work and write your answer in a complete sentence.

9. Ben bought M movie tickets for $8.50 each and B bags of popcorn for $3.50 each.
   a. Write an algebraic expression for the total amount Ben spent.

   b. Use this expression to determine the amount Ben will spend if he buys 6 movie tickets and 4 bags of popcorn. Show all of your work and write your answer in a complete sentence.

10. Noelle is 5 inches shorter than Amy. Amy is *A* inches tall.
    a. Write an algebraic expression for Noelle's height.

    b. Use this expression to determine Noelle's height if Amy is 5 feet 8 inches tall. Show all of your work and write your answer in a complete sentence.

11. Jamal studied H hours for a big test. Karla studied one fourth as long.
    a. Write an algebraic expression for the length of time that Karla studied.

    b. Use this expression to determine the length of time that Karla studied if Jamaal studied for 5 hours and 20 minutes. Show all of your work and write your answer in a complete sentence.

12. A caterer charges a delivery fee of $45 plus $6.50 per guest.
    a. Write an algebraic expression to represent the total catering cost if G guests attend the reception.

    b. Use this expression to determine the total catering cost for if 80 people attend the reception. Show all of your work and write your answer in a complete sentence.

13. Tickets to the museum cost $18 for adults and $12.50 for children.
    a. Write an algebraic expression to represent the cost for A adults and C children to visit the museum.

    b. Use this expression to determine the cost for 4 adults and 6 children to attend the museum. Show all of your work and write your answer in a complete sentence.

14. The formula to convert from Fahrenheit to Celsius is $C = \frac{5}{9}(F - 32)$. The temperature on a summer day in Phoenix, Arizona is 115ºF. What would this temperature be in degrees Celsius? Round your answer to the nearest tenth of a degree. Show all work, and write your answer in a complete sentence.

15. Isabel has a headache, and takes 500mg of Tylenol. The amount, A, of Tylenol (measured in mg) remaining in her body after *n* hours is given by the formula $A = 500(0.882)^n$. How much of the Tylenol remains in her body after 4 hours? Show all work, and round your answer to the nearest hundredth. Write your answer in a complete sentence.

16. A person's Body Mass Index (BMI) is given by the formula $BMI = \frac{703W}{H^2}$, where W is the weight of the person in pounds, and H is the person's height, measured in inches. If a person is 5 feet 7 inches tall, and weighs 142 pounds, what is that person's BMI? Show all of your work. Round your answer to the nearest tenth. Write your answer in a complete sentence.

17. The formula for the volume, V, of a cylinder of radius r and height h is $V = \pi r^2 h$. Determine the volume of a cylinder with radius 3 inches and height 8 inches. Write your answer in exact form (in terms of π) and in approximate form, rounded to the nearest hundredth. Include appropriate units in your answer

18. The formula A = $\frac{1}{2}bh$ gives the area of a triangle with base b and height h. Determine the area of a triangle with base 4cm and height $2\frac{2}{3}$ cm. Write your answer as a proper fraction or mixed number in simplest form. Include appropriate units in your answer.

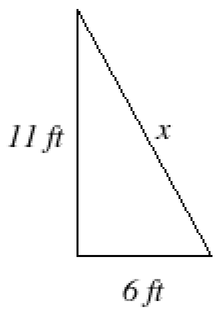
19. The formula $V = 9.54 + 0.08m$ represents the value of an investment (in thousands of dollars) after m months. Determine the value of this investment after two years.

20. The formula $E = 3861 - 77.2t$ gives the surface elevation (in feet above sea level) of Lake Powell t years after 1999. Use this formula to predict the surface elevation of lake Powell in the year 2016.

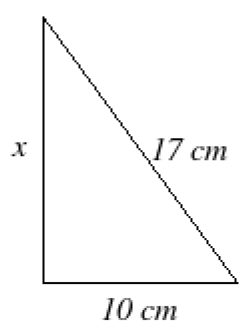
21. Simple interest is given by the formula $A = P + Prt$. Where A is the accrued value of the investment after t years, and P is the starting principal invested at an annual percentage rate of r, expressed as a decimal. Sally buys a \$5,000 savings bond that pays 2.3% simple interest each year. How much will the bond be worth after 5 years?

22. The formula for compound interest is $A = P(1 + r)^t$ where A is the accrued amount after t years, P is the starting principal, and r is the annual interest rate expressed as a decimal. If you invest \$12,000 at an annual interest rate of 1.7% and leave it there for 30 years, what would your ending balance be? Round your answer to the nearest cent.

23. Use the Pythagorean Theorem to find the length of side *x* of the right triangle shown below. Write your answer in **exact form** and in **approximate form**, rounded to the nearest thousandth. Include appropriate units in your answer.



24. Use the Pythagorean Theorem to find the length of side *x* of the right triangle shown below. Write your answer in **exact form** and in **approximate form**, rounded to the nearest thousandth. Include appropriate units in your answer.



Unit 1: Review

1. A towing company charges $3.50 for each mile plus a nonrefundable reservation fee of $12. Determine an algebraic expression to represent the total cost for towing your car m miles.

2. Tell the story of x in the following expression $2(3 - x)^5$

3. Evaluate the following expressions for the given values. Show all of your work. Use your graphing calculator to check your answers.

   a. $4x^2 - x + 3 \quad for\ x = -5$

   b. $x^2 - y^2 \ for\ x = -5,\ y = -3$

4. The formula to convert from Fahrenheit to Celsius is $C = \frac{5}{9}(F - 32)$. The temperature on a summer day in Phoenix, Arizona is 113ºF. What would this temperature be in degrees Celsius? Show all work, and write your answer in a complete sentence.

5. The formula for the volume, V, of a cylinder of radius r and height h is $V = \pi r^2 h$. Determine the volume of a cylinder with radius 5 cm and height 40 cm. Give the exact answer (with π) and the approximate answer, rounded to the nearest hundredth. Include appropriate units in your answer.

6. The formula for compound interest is $A = P(1 + r)^t$ where A is the accrued amount after t years, P is the starting principal, and r is the annual interest rate expressed as a decimal. Bianca invests $5000 at an annual interest rate of 4% and leaves it there for 10 years. What will her ending balance be? Show all of your work. Round your answer to the nearest cent.

7. The formula $P = 289(1.009)^t$ estimates the population of the United States (in millions of people), t years after 2002. Use this formula to estimate the U.S. population in 2013. Show all of your work. Round your answer to the nearest million.

Unit 2: Algebraic Expressions

Section 2.1: Some Vocabulary

Section 2.2: Like Terms

Section 2.3: The Distributive Property

Section 2.4: Simplifying Algebraic Expressions

Section 2.5: Applications

Unit 2 Notes

Unit 2: Video Lesson

Section 2.1: Some Vocabulary

Definitions
Terms: Parts of an algebraic expression separated by addition or subtraction symbols.
Constant Term: A number with no variable factors. A term whose value never changes.

Example 1: Consider the algebraic expression $4x^5 + 3x^4 - 22x^2 - x + 17$

a. List the terms. ____

b. Identify the constant term. ____________________

Definitions
Factors: Numbers or variables that are multiplied together
Coefficient: The number that multiplies the variable.

Example 2: Complete the table below.

	$-4m$	$-x$	$\frac{1}{2}bh$	$\frac{2r}{5}$
List the Factors				
Identify the Coefficient				

Example 3: Consider the algebraic expression $5y^4 - 8y^3 + y^2 - \frac{y}{4} - 7$

a. How many terms are there? ____________

b. Identify the constant term. _____________

c. What is the coefficient of the first term? ____________

d. What is the coefficient of the second term? ____________

e. What is the coefficient of the third term? ____________

f. List the **factors** of the fourth term. ___________________________

Section 2.1 – You Try

Consider the algebraic expression $2m^3 + m^2 - 2m - 8$

a. How many terms are there? ____________

b. Identify the constant term. _____________

c. What is the coefficient of the first term? ____________

d. What is the coefficient of the second term? ____________

e. List the **factors** of the third term. ___________________________

Section 2.2: Like Terms

Definition

Terms whose variable factors (letters *and* exponents) are exactly the same are called LIKE TERMS.

Identify the Like Terms

Example 1: Identify the like terms in each of the following expressions

$3a - 6a + 10a - a$

$5x - 10y + 6z - 3x$

$7n + 3n^2 - 2n^3 + 8n^2 + n - n^3$

Combine Like Terms

Example 2: Combine the like terms

$3a - 6a + 10a - a$

$5x - 10y + 6z - 3x$

$7n + 3n^2 - 2n^3 + 8n^2 + n - n^3$

Section 2.2 – You Try

Combine the like terms. Show all steps as in the media examples.

a. $3x - 4x + x - 8x$

b. $-5 + 2a^2 - 4a + a^2 + 7$

Section 2.3: The Distributive Property $a(b + c) = ab + ac$

Use the Distributive Property to Expand Each of the Following Expressions

Example 1: $5(2x + 4)$

Example 2: $-3(x^2 - 2x + 7)$

Example 3: $-(5x^4 - 8)$

Example 4: $\frac{2}{5}\left(\frac{x}{4} - \frac{1}{3}\right)$

Section 2.3 – You Try

Use the Distributive Property to expand the algebraic expression. Show all steps as in the media examples.

a. $-5(3x^2 - 2x + 8)$

b. $\frac{2}{3}\left(6x + \frac{1}{2}\right)$

Section 2.4: Simplifying Algebraic Expressions

Steps for Simplifying Algebraic Expressions
Step 1: Simplify within parentheses
Step 2: Use distributive property to eliminate parentheses
Step 3: Combine like terms.

Example 1: Simplify the following algebraic expressions. Show all possible steps.

a. $-3(2x - 4) - (3x + 8)$

b. $3[2 - (x - 5)] - (4x - 10)$

c. $\frac{8-5x}{2}$

d. $\frac{9-3(2x-5)}{-6}$

Section 2.4 – You Try

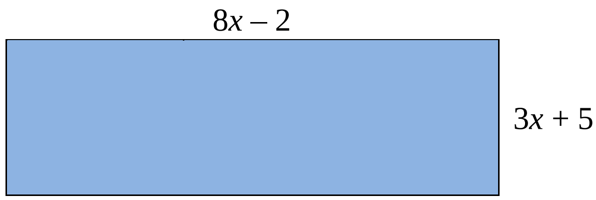
Simplify completely. Show all steps as in the media examples.

a. $2(7x^2 + 3x + 2) - (8x^2 - 7)$

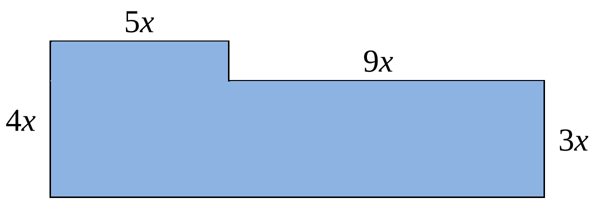
b. $\frac{2(x-6)+8}{2}$

Section 2.5: Applications

Example 1: The perimeter of a rectangle is given by the formula *2·Length + 2·Width*. Write an algebraic expression that represents the **perimeter** of the figure shown below. Simplify completely. The perimeter of a rectangle is given by the formula



Example 2: Write an algebraic expression that represents the **perimeter** of the figure shown below. Simplify completely.



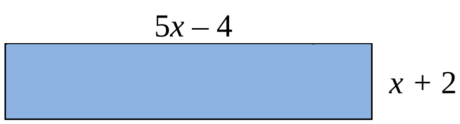
Example 3: A clothing store is having a '65% off' sale on all its merchandise. Let P represent the original price of an item at the store. Write an algebraic expression to represent the sale price of the item. Simplify your answer.

Example 4: A local courier service estimates its monthly operating costs to be \$1500 plus \$0.85 per delivery. The service generates revenue of \$6 for each delivery. Let *D* represent the number of deliveries in a given month. Write an algebraic expression that represents the monthly **profit** for making *D* deliveries per month.

Section 2.5 – You Try

Simplify completely. Show all steps as in the media examples.

a. Write an algebraic expression that represents the perimeter of the figure shown below. Simplify completely.   Show your work.



b. Suppose sales tax in your town is currently 9%. Write an algebraic expression representing the total amount paid for an item that costs D dollars after sales tax is added to the purchase. Simplify your answer.

Unit 2: Practice Problems

Skills Practice

1. Complete the table below.

	$5t$	$-3abc$	$-y$	x	$\frac{3}{5}x$	πd	$\frac{4x}{7}$	$\frac{m}{5}$
Identify the Coefficient								

2. Consider the algebraic expression $5n^8 - n^5 + n^2 + \frac{n}{8} - 1$

   a. How many terms are there? _____________

   b. Identify the constant term. ______________

   c. What is the coefficient of the first term? _____________

   d. What is the coefficient of the second term? _____________

   e. What is the coefficient of the third term? _____________

   f. List the **factors** of the fourth term. _____________________________

3. Consider the algebraic expression $w^3 - w^2 - \frac{2w}{3} + 3$

   a. How many terms are there? _____________

   b. Identify the constant term. ______________

   c. What is the coefficient of the first term? _____________

   d. What is the coefficient of the second term? _____________

   e. What is the coefficient of the third term? _____________

4. Identify and combine the Like Terms.

a. $3d - 5d + d - 7d$

b. $3x^2 + 3x^3 - 9x^2 + x - x^3$

c. $a - 2b + 4a + b - (-2b)$

d. $\frac{2}{5}r - \frac{2}{3}r + r$

5. Apply the distributive property to expand the following expressions.

a. $6(4x - 8)$

b. $-5(6w^2 - 3w + 1)$

c. $-(4y^2 + 3y - 8)$

d. $\frac{3}{4}\left(\frac{2}{5}x + \frac{7}{12}\right)$

e. $\frac{1}{3}\left(\frac{3}{4}b - 5\right)$

f. $-2\left(n^2 - 5n + \frac{1}{4}\right)$

6. Simplify by using the distributive property and combining like terms. Show all steps.

a. $(5x^2 + 3x - 6) - (3x + 6)$

b. $3(2x^2 - x + 3) + 2$

c. $2a + 3ab - 5a + 8ab + 3b$

d. $12 + 3x^2 + 4x - 2x^2 - x - 6$

e. $5(2x + 3) + 4(3x - 7)$

f. $-2(4x^2 + 3x - 2) - (x^2 - 6)$

7. Simplify completely. Show all steps.

a. $\frac{12-9x}{3}$

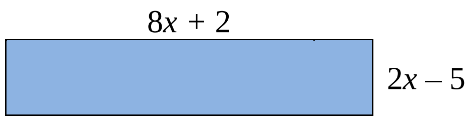
b. $\frac{21m-18}{6}$

c. $\frac{3(4a-8)+2}{2}$

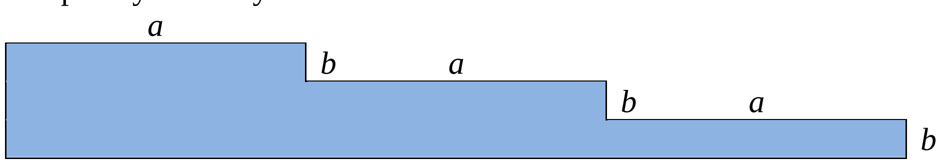
d. $\frac{3(10x-4)+6}{6} + 3x + 1$

Applications

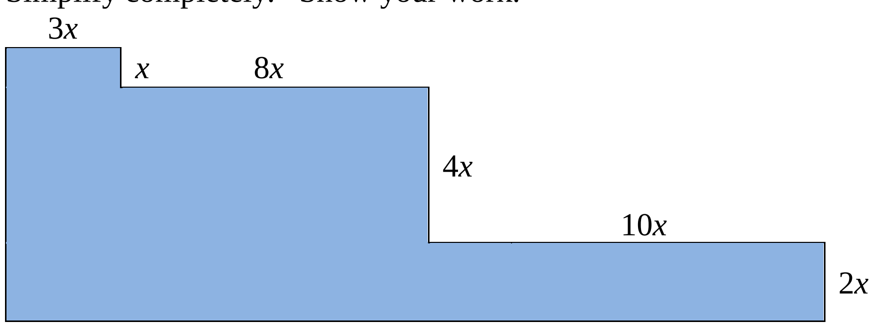
8. Write an algebraic expression that represents the perimeter of the figure shown below. Simplify completely.   Show your work.



9. Write an expression that represents the perimeter of the figure shown below. Simplify completely. Show your work.



10. Write an algebraic expression that represents the perimeter of the figure shown below. Simplify completely.   Show your work.



11. Let B represent the bill for dinner at your favorite restaurant. Write an algebraic expression to represent the total amount paid for dinner if you decide to leave an 18% tip. Simplify your answer.

12. A clothing store is having a '40% off' sale on all its merchandise. Let P represent the original price of an item at the store. Write an algebraic expression to represent the sale price of the item. Simplify your answer.

13. Suppose sales tax in your town is currently 9.8%. Write an algebraic expression representing the total amount paid for an item that costs D dollars after sales tax is added to the purchase. Simplify your answer.

14. An account earns 3% interest each year. Let P represent the initial amount invested in this account. Write an algebraic expression representing balance in the account at the end of one year. Simplify your answer.

15. February is a busy time at Charlie's Chocolate Shoppe! During the week before Valentine's Day, Charlie advertises that his chocolates will be selling for \$1.50 a piece (instead of the usual \$2.00 each). The fixed costs to run the Chocolate Shoppe total \$650 for the week, and he estimates that each chocolate costs about \$0.60 to produce. Write an algebraic expression that represents Charlie's **profit** from selling *n* chocolates during the week before Valentine's Day. (HINT: Profit = Revenue – Costs) Simplify your answer.

Unit 2: Review

1. Consider the algebraic expression $6n^3 - n^2 + \frac{5n}{8} - 11$

    a. How many terms are there? _____________

    b. Identify the constant term. ______________

    c. What is the coefficient of the first term? _____________

    d. What is the coefficient of the second term? _____________

    e. List the **factors** of the third term. _____________________________

2. Identify and combine the Like Terms. Write your answer in descending order.

    $5x^2 - 8x - 5x^3 - 9x^2 + x - x^3$

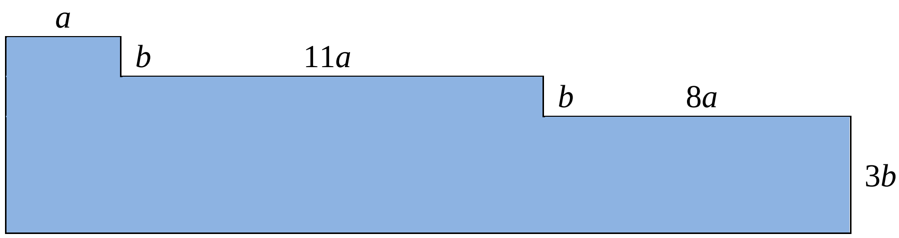
3. Simplify by using the distributive property and combining like terms. Show all steps.

    $2(5x + 3y) - (3x + 6y)$

4. Simplify completely. Show all steps.

    $\frac{8x+2}{4}$

5. Write an expression that represents the perimeter of the figure shown below. Simplify completely. Show your work.



6. Let B represent the bill for dinner at your favorite restaurant. Write an algebraic expression to represent the total amount paid for dinner if you decide to leave a 15% tip. Simplify your answer.

7. Leonard has started a new business making cartoon bedspreads. His monthly expenses are \$1322. Each bedspread costs \$8.50 to produce. Leonard is selling each bedspread for \$17.50. Write an algebraic expression that represents Leonard's **profit** from selling *n* bedspreads. Simplify your answer.

Unit 3: Solving Equations

Unit 3 Notes

Unit 3: Video Lesson

Section 3.1: Algebraic Equations

Definition
An algebraic equation is a mathematical sentence stating that an algebraic expression is *equal to* a specified value, variable, or another expression. The solution to an equation is the value, or values, that make the equation true.

Verify that a given value is a solution to an equation

Example 1: Verify that x = -3 is a solution to the algebraic equation $5x - 2 = 8x + 7$.

Example 2: Is m = -1 a solution to the algebraic equation $m + 9 = 3m + 5$?

Example 3: Is a = 5 a solution to the algebraic equation $-4(a + 1) = 6(1 - a)$?

Definition
Equivalent equations are two or more equations that have the same solution.

Example 4: Verify that $x = 2$ is a solution to the following equations.

$8x - 5 = x + 9$ $\quad$ $7x - 5 = 9$ $\quad$ $7x = 14$

Section 3.1 – YOU TRY

Complete the following problems. Show all steps as in the media examples.

a. Verify that $p = -9$ is a solution to the algebraic equation $p - 4 = 2p + 5$.

b. Verify that $x = 2$ is a solution to the algebraic equation $2(5x - 12) = 1 - 5(x - 1)$.

Section 3.2: Solving One-Step Equations

Properties of Equality
The Addition/Subtraction Property of Equality: If $a = b$, then $a + c = b + c$. If $a = b$, then $a - c = b - c$ The Multiplication/Division Property of Equality: If $a = b$, then $a \times c = b \times c$. If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$

Definition
To <u>solve an equation</u> means to "undo" all the operations of the equation, leaving the variable by itself on one side. This is known as **isolating the variable.**

Solve for the variable in each of the following equations. Check your answers.

Example 1: $x + 7 = 18$

Example 2: $r - 4 = -5$

Example 3: $-4 + b = 45$

Example 4: $3 = 19 + m$

Example 5: $-3y = -42$

Example 6: $\frac{x}{6} = -5$

Example 7: $\frac{3}{4}a = 8$

Example 8: $17 = -x$

Section 3.2 – YOU TRY

Solve for the variable in each equation and check your answer. Show all steps as in the media examples.

a. $12 + x = -40$

b. $\frac{3}{5}n = -2$

c. $14 = -x$

d. $-3 = \frac{w}{5}$

Section 3.3: Solving Two-Step Equations

STEPS FOR SOLVING A LINEAR TWO-STEP EQUATION

1. Apply the Addition/Subtraction Property of Equality.
2. Apply the Multiplication/Division Property of Equality to isolate the variable.
3. Check by substituting your answer into the original equation.

Solve for the variable in each of the following equations. Check your answers.

Example 1: Solve: $2b - 4 = 12$ Check:

Example 2: Solve: $4 + 3r = 5$ Check:

Example 3: Solve: $3 = 19 - 2m$ Check:

Example 4: Solve: $11 - y = 32$ Check:

Example 5: Solve: $3 + \frac{3}{5}x = 12$ Check:

Section 3.3 – YOU TRY

Solve for the variable in each equation and check your answer. Show all steps as in the media examples.

a. Solve: $14 - 3x = -40$ Check:

b. Solve: $\frac{3}{4}w - 8 = -2$ Check:

c. Solve: $14 = 2 - x$ Check:

Section 3.4: Solving Multi-Step Equations

STEPS FOR SOLVING A LINEAR EQUATION
1. Simplify each side of the equation. Remove parenthesis if necessary. Combine like terms.
2. Add or subtract terms on each side of the equation so that all terms containing the variable are on one side and all constant terms are on the other side.
3. Simplify each side of the equation by combining like terms.
4. Apply the Multiplication/Division Property of Equality to isolate the variable.
5. Check by substituting the solution into the original equation.

Solve for the variable in each of the following equations. Check your answers.

Example 1: Solve $x - 5 = 4x + 7$ Check

Example 2: Solve $3(4n - 2) = 5(n + 3)$ Check

Example 3: Solve $4-(2y-1)=2(5y+9)+y$ Check:

Example 4: Solve $-1+5(x-2)=12x+3-7x$ Check:

Example 5: Solve $7(x+4)-10=3x+20+4x-2$ Check:

Section 3.4 – You Try

Solve for the variable in each equation and check your answer. Show all steps as in the media examples.

a. Solve $m - 5 = 8m + 2$ Check:

b. Solve $2(5x - 12) = -(5x - 6)$ Check:

c. Solve $9(x+3) - 6 = 24 - 2x - 3 + 11x$ Check:

Section 3.5: Solving Equations – Applications

For this type of problem, first determine the Givens and the Goal, then form a Strategy, Solve, and Check. Write your answer in a complete sentence.

Example 1: The maximum heart rate is the highest heart rate achieved during maximal exercise. In general, you gain the most benefits and lessen the risks when you exercise within your *target* heart rate zone. Usually this is when your exercise heart rate (pulse) is about 70% percent of your maximum heart rate. The formula $T = 0.7(220 - a)$, gives the target heart rate, T, in beats per minute, for a person who is a years of age. Determine the age of a person whose target heart rate is 135 beats per minute.

GIVEN:

GOAL:

STRATEGY:

SOLUTION:

CHECK:

FINAL RESULT AS A COMPLETE SENTENCE:

Section 3.5 – YOU TRY

For this problem, identify the Givens the Goal. Form a strategy, solve, check, and write your answer in a complete sentence. Show all steps.

The cost of tuition at a local community college is given by the equation $C = 76n$, where C represents the total cost of tuition and *n* represents the number of credits taken. If you have $800 dollars to spend on tuition, how many credits can you take?

GIVEN: GOAL:

STRATEGY:

SOLUTION: CHECK:

FINAL RESULT AS A COMPLETE SENTENCE:

Section 3.6: Writing Equations

Steps for Writing and Solving Equations	
Step 1:	Read and understand the problem. Underline the givens and circle the goal.
Step 2:	Form a strategy to solve the problem.
Step 3:	Choose a variable to represent the unknown quantity.
Step 4:	Read every word in the problem, and translate the given information into an algebraic equation.
Step 5:	Solve the equation
Step 6:	Write your answer in a complete sentence

Example 1: The cost of leasing a new Ford mustang is $2,311 for a down payment and processing fee plus $276 per month. For how many months can you lease this car with $10,000?

Example 2: You have just bought a new Sony 55” 3D television set for $1,600. The value of the television set decreases by $250 per year. How long before the television set is worth half of its original value?

Section 3.6 – YOU TRY

Your yard is a mess, and you decide to hire a landscaper. The Garden Pros charges a $50 consultation fee plus $36 per hour for the actual work. If the total cost is $212, how many hours did the landscapers work?

a. Write an equation to represent this situation. Clearly indicate what the variable represents.

b. Solve the equation. Show all work, and write your answer in a complete sentence. Your answer must include correct units of measure.

Unit 3: Practice Problems

Skills Practice

1. Verify that $a = -1$ is a solution to $4 - a = 6a + 11$. Show all work.

2. Verify that $x = -5$ is a solution to $3(2x + 4) = 8(x + 2) + 6$. Show all work.

3. Is $x = 8$ a solution to the equation $-16 = \frac{3}{4}x - 10$? Answer yes or no, and show all supporting work.

4. Is $x = -3$ a solution to the equation $3(6 + 2x) = 8 + (x - 5)$? Answer yes or no, and show all supporting work.

5. Solve for the variable in each of the following equations. Reduce, simplify, and check your answers. Show all steps, and box your answer.

   a. $8x - 2 = 30$ Check:

   b. $5 - x = 3$ Check:

   c. $-\frac{1}{2}x - 4 = 8$ Check:

   d. $\frac{2}{3}x + 3 = 15$ Check:

e. $4x - 8 = -x + 7$ Check:

f. $\frac{3}{4}x - \frac{1}{2} = \frac{9}{8}x + \frac{3}{2}$ Check:

g. $6x - 4(-2x + 8) = 10$ Check:

h. $-2(4x - 2) = -(2x - 8)$ Check:

i. $(2x - 7) - (4x + 8) = 4(x + 6)$ Check:

Applications

For each of the following, *underline* the Givens and *circle* the Goal of the problem. Form a Strategy, Solve, and Check. Show all work, and write your answer in a complete sentence.

6. John is a door to door vacuum salesman. His weekly salary, S, is \$200 plus \$50 for each vacuum he sells. This can be written as $S = 200 + 50v$, where v is the number of vacuums sold. If John earns \$1000 for a week's work, how many vacuums did he sell?

7. Paul is planning to sell bottled water at the local Lollapalooza. He buys 2 crates of water (2000 bottles) for \$360 and plans on selling the bottles for \$1.50 each. Paul's profit, P in dollars, from selling b bottles of water is given by the formula $P = 1.5b – 360$. How many bottles does Paul need to sell in order to break even?

8. Ringo has \$100 in the bank and is adding \$50 each week in savings. George has \$250 in the bank, and is adding \$40 each week in savings. Their plan is to wait until their savings are equal and then buy a Magic Yellow Bus and take a road trip. They figure out that the equation can be written as $50w + 100 = 40w + 250$, where w is the number of weeks. How long will it take for their savings to be equal?

9. The formula for the area, A, of a triangle with base b and height h is $A = \frac{1}{2}bh$. Determine the height of a triangle with a base of 18 inches and area 84.6 square inches. Round your answer to the nearest tenth, and include appropriate units in your answer.

10. Suppose you want to accumulate \$1,000,000 for your retirement in 30 years. You decide to put money into an account that earns 3% interest compounded annually. How much should you deposit? The formula for compound interest is $A = P(1 + r)^t$, where A is the accrued amount after t years, P is the starting principal, and r is the annual interest rate expressed as a decimal. Round your answer *up* to the nearest cent.

11. Andrew and Andrea want to start a college fund for their baby girl. They decide to put money into an investment that is expected to earn 4.2% simple interest each year. How much would they have to deposit now in order to accumulate \$100,000 by the time their newborn goes to college in 18 years? The formula for simple interest is $A = P + Prt$, where A is the accrued value of the investment after t years, r is the interest rate (expressed as a decimal), and P is the starting principal invested. Round your answer *up* to the nearest cent.

12. February is a busy time at Charlie's Chocolate Shoppe! During the week before Valentine's Day, Charlie advertises that his chocolates will be selling for $1.80 a piece (instead of the usual $2.00 each). The fixed costs to run the Chocolate Shoppe total $450 for the week, and he estimates that each chocolate costs about $0.60 to produce. Write an equation to represent Charlie's **profit**, P, from selling *n* chocolates during the week before Valentine's Day. (HINT: Profit = Revenue – Total Costs) use this equation the number of Chocolates Charlie will need to sell in order to break even.

13. A new Sony 55" 3D television set costs $2,499. You are going to pay $600 as a down payment, and pay the rest in equal monthly installments for one year. Write an equation to represent this situation, and use it to determine how much you should pay each month. Clearly indicate what the variable in your equation represents.

14. Your yard is a mess, and you decide to hire a landscaper. The Greenhouse charges a $20 consultation fee plus $11 per hour for the actual work. Garden Pros does not charge a consulting fee, but charges $15 per hour for the actual work. Write an equation that will help you determine the number of hours at which the two companies charge the same. Clearly indicate what the variable represents. Solve the equation, and write your answer in a complete sentence.

15. Let p represent the marked price of an item at Toys R Us. Emma's aunt gave her a \$50 gift card to Toys R Us for her birthday. If sales tax is currently 9%, set up an equation to express how much she can spend using her gift card. Clearly indicate what the variable represents. Solve the equation, and interpret your answer in a complete sentence.

Unit 3: Review

1. Solve the following equations for *x*. Show your work. Reduce, simplify and CHECK your answers!

   a. $7 - (a - 3) = 3(2a - 6)$ Check

   b. $-31 = \frac{3}{5}x - 10$ Check

2. The formula to convert from Celsius to Fahrenheit is $F = \frac{9}{5}C + 32$. The temperature on a summer day in Phoenix, Arizona is 113ºF. What would this temperature be in degrees Celsius? Show all work, and write your answer in a complete sentence

3. You decide to invest \$7000 into an account that pays 5% simple interest each year. How long will it take for the investment to double in value?

   The formula for simple interest is $A = P + Prt$, where A is the accrued value of the investment after t years, r is the interest rate (expressed as a decimal), and P is the starting principal invested.

   Show all steps, and write your answer in a complete sentence.

4. Carlos recently hired a roofer to do some necessary work. On the final bill, Carlos was charged a total of \$1105. \$435 was listed for parts and the rest for labor. If the hourly rate for labor was \$67, how many hours of labor was needed to complete the job?

   a. Write an *equation* that can be used to determine the number of hours needed to complete the job. **Clearly indicate what the variable represents.**

   b. Solve the equation. Show all steps, and write your answer in a complete sentence.

Unit 4: Inequalities

Unit 4 Notes

Unit 4: Video Lesson

Section 4.1: Inequalities

Symbol	In words	Examples
$<$		
$\leq$		
$>$		
$\geq$		
$\neq$		

Definitions
An **algebraic inequality** is a mathematical sentence connecting an expression to a value, variable, or another expression with an inequality sign.
A **solution** to an inequality is a value that makes the inequality true.

Example 1: Determine whether the number 4 is a solution to the following inequalities.

$x > 1$ $\quad$ $x < 1$ $\quad$ $x \leq 9$ $\quad$ $x > 4$ $\quad$ $x \geq 4$

THE SOLUTION SET OF A LINEAR INEQUALITY

Inequality	Graph	Interval Notation
$x > 2$	$-\infty \longleftrightarrow \infty$ $-\infty \longleftrightarrow \infty$	
$x \geq 2$	$-\infty \longleftrightarrow \infty$ $-\infty \longleftrightarrow \infty$	
$x < 2$	$-\infty \longleftrightarrow \infty$ $-\infty \longleftrightarrow \infty$	
$x \leq 2$	$-\infty \longleftrightarrow \infty$ $-\infty \longleftrightarrow \infty$	

Translate a statement into an inequality

Example 2: Write an inequality to represent the following situation. Clearly indicate what the variable represents.

a. In order to go on the ride, a child must be more than 48 inches tall.

b. Jordan can spend at most $10 on lunch.

Section 4.1 – You Try

Complete the following problems.

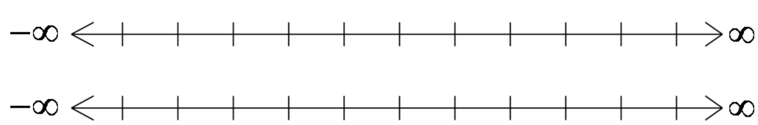
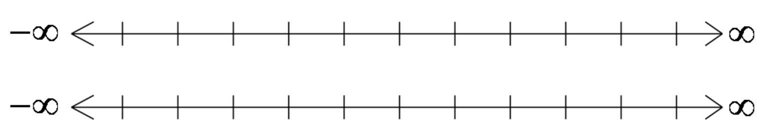
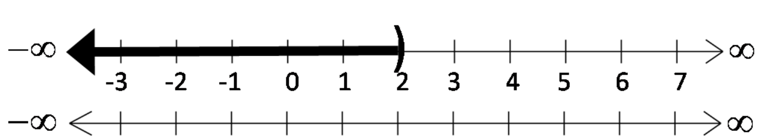
a. Which of the following values are in the solution set for $n < 5$?

$n = -3$ $n = 0$ $n = 4.99$ $n = 5$ $n = 12$

b. Translate the statement into an inequality. Let a represent the age of a child.

Children age 2 and under are free at Disneyland

c. Complete the table below:

Inequality	Graph	Interval Notation
$x \geq -3$		
		$(-\infty, 11]$
		

Section 4.2: Solving Linear Inequalities

STEPS FOR SOLVING A LINEAR INEQUALITY
1. Simplify each side of the inequality. Remove parenthesis if necessary. Collect like terms.
2. Add or subtract terms on each side of the inequality so that all terms containing the variable are on one side and all constant terms are on the other side.
3. Simplify each side of the inequality by combining like terms.
4. Multiply or divide on both sides to isolate the variable. CAUTION*!!! If you multiply or divide both sides of an inequality by a* **negative number**, *you have to reverse the inequality sign.*
5. Check by substituting the solution (*endpoint and a value from the solution set*) into the original inequality.

Solve the inequality, check your answer, and graph the solution on a number line.

Example 1: Solve the inequality, check your answer, and graph the solution on a number line.

$3x > x + 6$

Graph:

$-\infty \longleftrightarrow \infty$

$-\infty \longleftrightarrow \infty$

Interval Notation: ________________

Example 2: Solve the inequality and graph the solution on a number line.

$3 - 5a \le 2(a + 5)$

Graph:

$-\infty \longleftrightarrow \infty$

$-\infty \longleftrightarrow \infty$

Interval Notation: ________________

Example 3: Solve the inequality and graph the solution on a number line.

$-5(x + 2) \geq -3(x + 4)$

Graph:

$-\infty \longleftrightarrow \infty$

$-\infty \longleftrightarrow \infty$

Interval Notation: ________________

Section 4.2 – You Try

Solve the inequality, check your answer, and graph the solution on a number line.

a. $7 - 4x \geq -5$

Graph:

$-\infty \longleftrightarrow \infty$

$-\infty \longleftrightarrow \infty$

Interval Notation: ________________

.

b. $6x + 13 < 5(2x - 3)$

Graph:

$-\infty \longleftrightarrow \infty$

$-\infty \longleftrightarrow \infty$

Interval Notation: ________________

Section 4.3: Solving Inequalities – Applications

For each problem, underline the Givens and circle the Goal. Form a Strategy, Solve, and Check. Write your answer in a complete sentence.

Example 1: The cost of tuition is $76 per credit hour. Write an *inequality* that can be used to determine the number of credit hours a student can take for under $1000. Solve the inequality, and write your answer in a complete sentence.

Example 2: Sean owns a business that builds computers. The fixed operating costs for his business are $2,700 per week. In addition to fixed operating costs, each computer costs $600 to produce. Each computer sells for $1,500.   Write an *inequality* that can be used to determine the number of computers Sean needs to sell in order make a profit each week. Solve the inequality, and write your answer in a complete sentence.

Section 4.3 – YOU TRY

Gasoline costs $3.79 per gallon.

a. Write an *inequality* that can be used to determine how many gallons of fuel can be purchased for under $20. Clearly indicate what the variable represents.

b. Solve the inequality in part a, and write your answer in a complete sentence.

Unit 4: Practice Problems

Skills Practice

1. For each of the following, circle *all* correct answers.

   a. Which of the given values are in the solution set for $x < 3$?

   $x = 0$ $x = -1$ $x = -5$ $x = 3$ $x = 5$ $x = -\frac{5}{3}$

   b. Which of the given values are in the solution set for $x \geq -1$?

   $x = 0$ $x = -1$ $x = -5$ $x = 3$ $x = 5$ $x = -\frac{5}{3}$

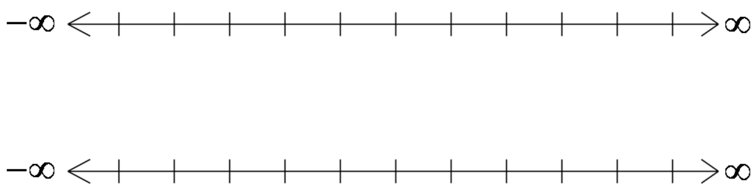
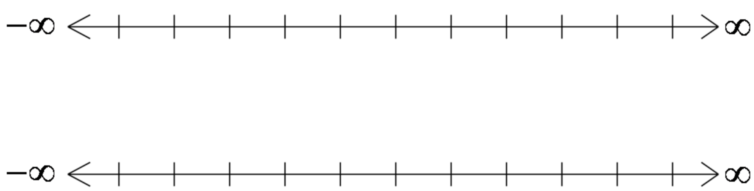
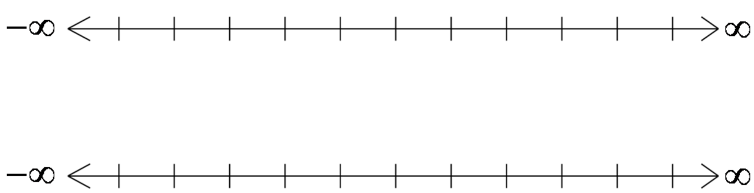
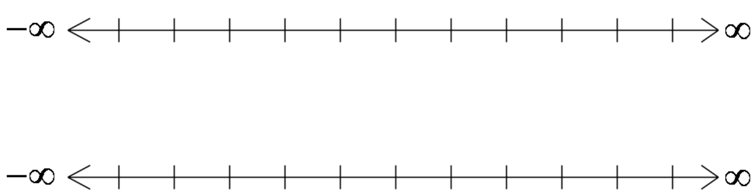
   c. Which of the given values are in the interval $[-2, \infty)$?

   $x = 0$ $x = -1$ $x = -5$ $x = 3$ $x = 5$ $x = -\frac{5}{3}$

   d. Which of the given values are in the interval $(-\infty, -1)$?

   $x = 0$ $x = -1$ $x = -5$ $x = 3$ $x = 5$ $x = -\frac{5}{3}$

2. Complete the table below:

Inequality	Graph	Interval Notation
$x > 8$		
$x \le -1$		
		$(-2, \infty)$
		$(-\infty, 6]$

3. Solve the inequality, showing all steps. Write your answer as an inequality *and* in interval notation, then graph the solution set on the number line.

$4x \le 2x + 12$

Interval Notation: ________________

Graph:

$-\infty \longleftrightarrow \infty$

$-\infty \longleftrightarrow \infty$

4. Solve the inequality, showing all steps. Write your answer as an inequality *and* in interval notation, then graph the solution set on the number line.

$14m + 8 > 6m - 8$

Interval Notation: ________________

Graph:

$-\infty \longleftrightarrow \infty$

$-\infty \longleftrightarrow \infty$

5. Solve the inequality, showing all steps. Write your answer as an inequality *and* in interval notation, then graph the solution set on the number line.

$5(-2a - 8) \le -9a + 4$

Interval Notation: ________________

Graph:

$-\infty \longleftrightarrow \infty$

$-\infty \longleftrightarrow \infty$

Applications

6. Translate each of the given statements into an algebraic inequality.

   a. You must be at least 13 years of age in order to view a PG-13 movie. Let *a* represent your age.

   b. Your car's gas tank can hold up to 25 gallons of gas. Let *g* represent the number of gallons in your gas tank.

   c. A company must sell more than 850 items in order to make a positive profit. Let *n* represent the number of items sold.

   d. Challenge Problem: The maximum heart rate, M, is the highest heart rate achieved during maximal exercise. In general, you gain the most benefits and lessen the risks when you exercise within your *target* heart rate zone. Usually this is when your exercise heart rate is between 60 and 80 percent of your maximum heart rate. Let T represent your target heart rate.

7. You have $1200 for your trip to the beach. You estimate that it will cost $160 a day for food, entertainment and hotel, plus $230 round trip air fair.

   a. Write an *inequality* that can be used to determine the maximum number of days you can stay at the beach. Clearly indicate with the variable represents.

   b. Solve the inequality, and interpret your answer in a complete sentence.

8. Let *p* represent the marked price of an item at Toys R Us. Bella's aunt gave her a $100 gift card to Toys R Us for her birthday.

   a. If sales tax is currently 9%, set up an algebraic *inequality* to express how much she can spend using her gift card. Clearly indicate what the variable represents.

   b. Solve the inequality, and interpret your answer in a complete sentence.

9. Your car is worth $1000 at most. It is old. You find out that it needs repairs to pass inspection. The auto shop tells you that the parts cost a total of $520, and the labor cost is $68 per hour. If the repairs are more than the car is worth, you are going to donate the car to charity.

   a. Write an *inequality* that can be used to determine the maximum number of hours the mechanic can spend working on your car to help you decide to repair it or donate it. Clearly indicate what the variable represents.

   b. Solve the inequality, and interpret your answer in a complete sentence.

Unit 4: Review

1. Which of the given values are in the interval $(–1, \infty)$? Circle all that apply.

   $x = 0$ $x = –1$ $x = –5$ $x = 3$

2. Which of the given values are in the interval $(-\infty, 5]$? Circle all that apply.

   $x = 8$ $x = –2$ $x = –3$ $x = 5$

3. You have $1400 for your trip to the beach. You estimate that it will cost $250 a day for food, entertainment and hotel, plus $198 for round trip air fair.

   a. Write an *inequality* that can be used to determine the maximum number of full days you can stay at the beach. Clearly indicate what the variable represents.

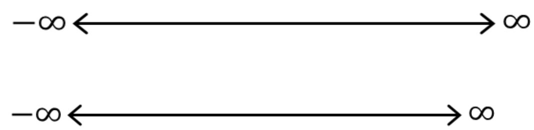
   b. Solve the inequality, and interpret your answer in a complete sentence.

4. Solve the inequality, showing all steps. Write your answer as an inequality *and* in interval notation, then graph the solution set on the number line.

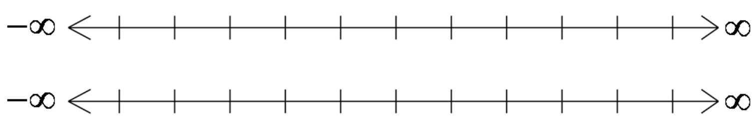
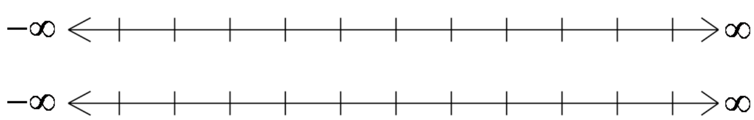
$1 - 3x > 14 - (4 - 6x)$

Interval Notation: ________________

Graph:



5. Complete the table below.

Inequality	Graph	Interval Notation
$x < 0$		
		$[-3, \infty)$

Unit 5: Graphs

Unit 5 Notes

Unit 5: Video Lesson

Section 5.1:   The Cartesian Plane

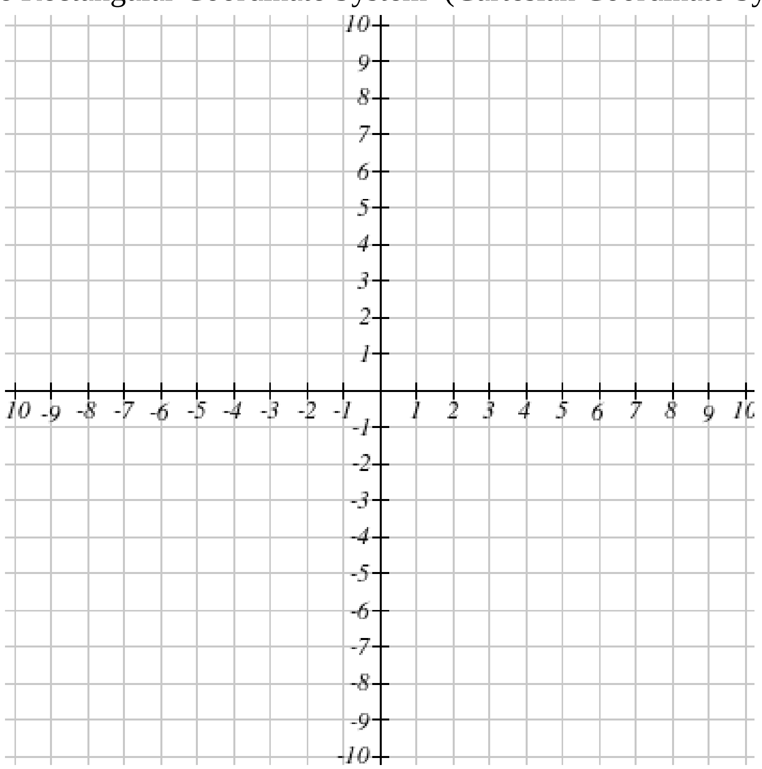
In this chapter, we will begin looking at the relationships between two variables. Typically one variable is considered to be the **INPUT**, and the other is called the **OUTPUT**. The input is the value that is considered first, and the output is the value that corresponds to or is matched with the input. The input/output designation may represent a cause/effect relationship, but that is not always the case.

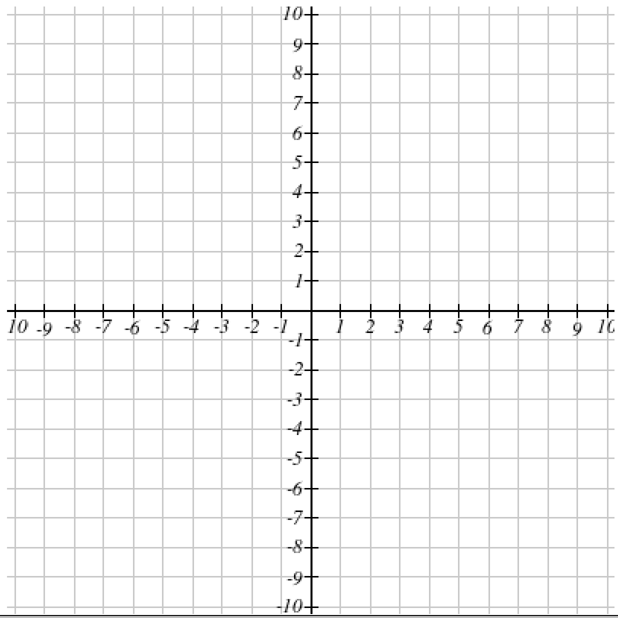
Ordered Pairs

Example 1: Ordered Pairs (input value, corresponding output value)

Input	Output	Ordered Pairs (input, output)
4	–3	
5	8	
		(0, –4)
		(–2, 6)

Example 2: The Rectangular Coordinate System (Cartesian Coordinate System)





Plot and label the points.

A. (–4, 2)

B. (3, 8)

C. (0, –5)

D. (–6, –4)

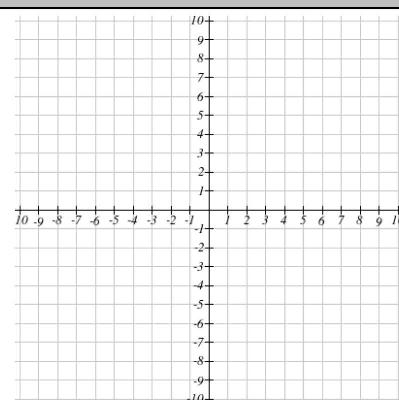
E. (5, 0)

F. (2, –8)

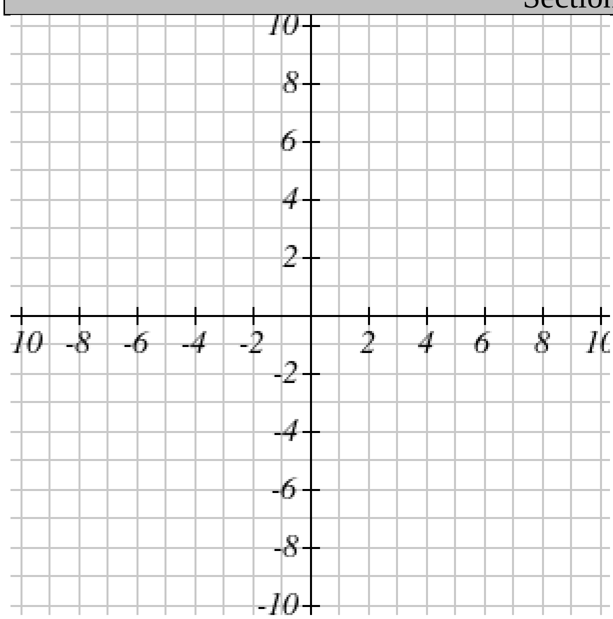
G. (0, 0)

Quadrants

Quadrant	Coordinates
I	(+, +)
II	(–, +)
III	(–, –)
IV	(+, –)



Section 5.1 – You Try



Plot and label the points.

A. (6, –3)

B. (1, 9)

C. (–4, 0)

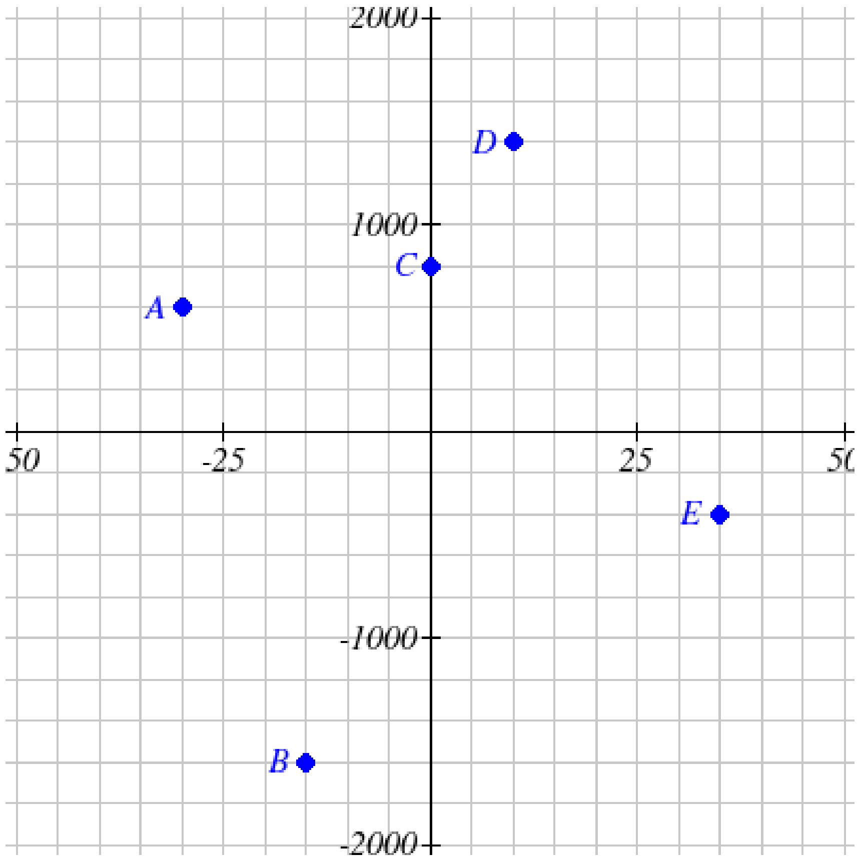
D. (–2, –8)

E. (0, 5)

F. (–9, 7)

Section 5.2: Working with Scale in the Cartesian Plane

Example 1: Give the coordinates of each of the points shown below.



A. ____________

B. ____________

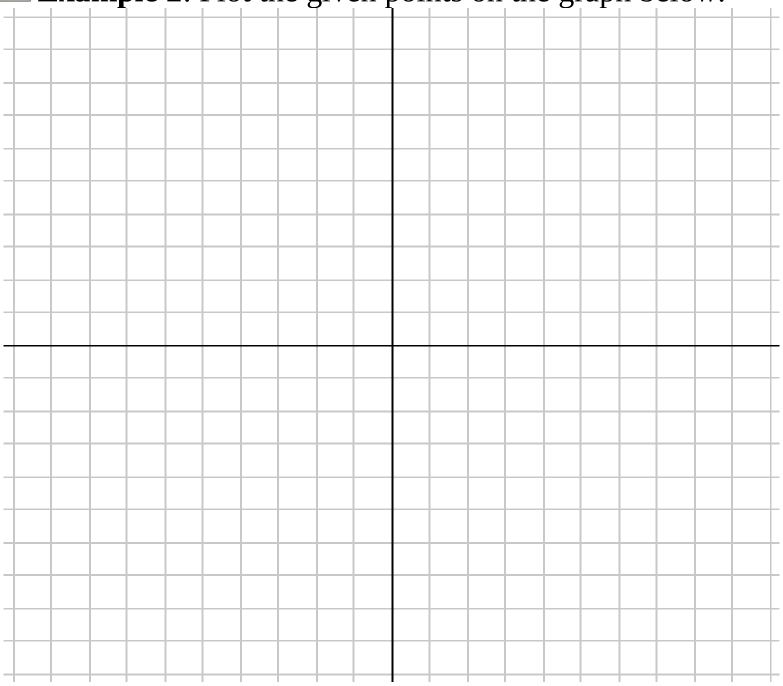
C. ____________

D. ____________

E. ____________

Tips for Choosing a Scale
• For the horizontal axis, start by identifying the lowest input value and the highest input value that must be plotted. Your scale must *start* at or below the lowest value, and *end* at or above the highest value. • Choose "nice" intervals for the tick marks on your scale. (In general, 10's and 5's are better than 7's or 8's). All tick marks must be equally spaced. • Do the same for the output values on the vertical axis. NOTE: The scales for the input and output do not need to be the same!

Example 2: Plot the given points on the graph below.



A. (–800, 1.8)

B. (550, 0.2)

C. (180, 0)

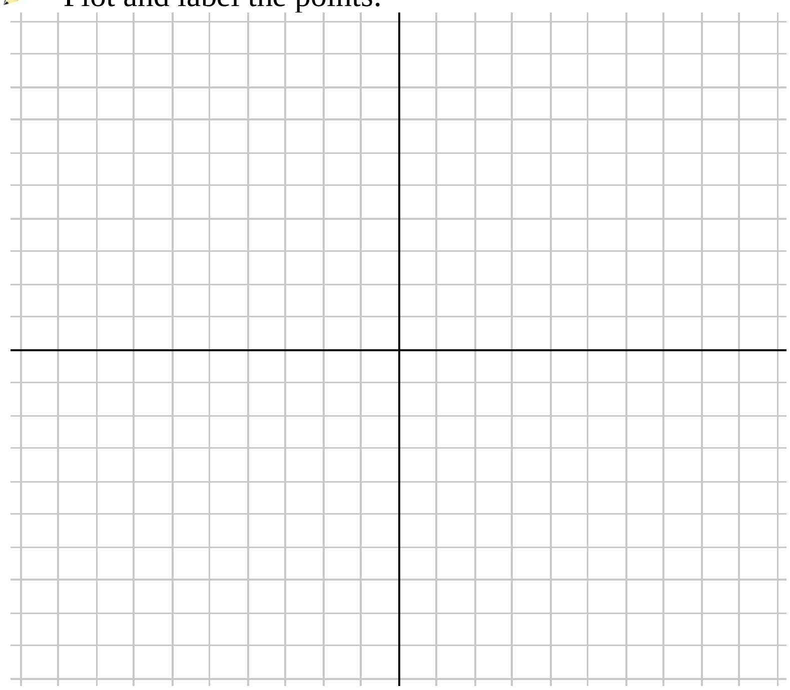
D. (0, –1.5)

E. (425, –0.4)

F. (–950, 1)

Section 5.2 – You Try

Plot and label the points.



A. (35, 125)

B. (0, 100)

C. (-40, 0)

D. (-30, 150)

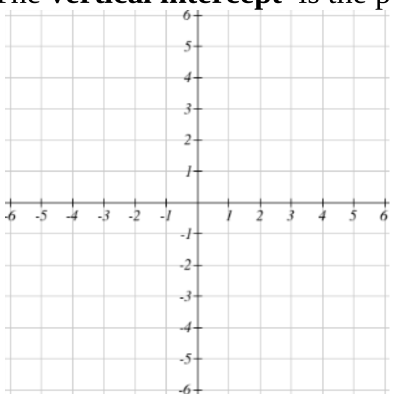
E. (-25, -175)

F. (5, -75)

Section 5.3: Characteristics of Graphs

Vertical and Horizontal Intercepts

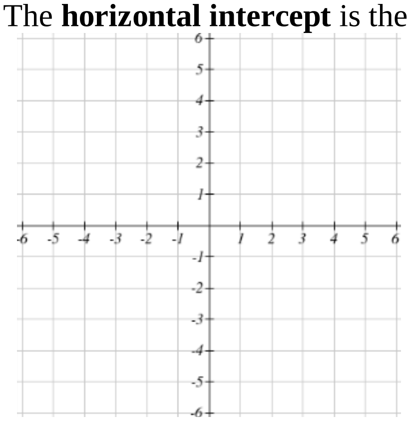
The **vertical intercept** is the point at which the graph crosses the vertical axis.



The input value of the vertical intercept is always____________

The coordinates of the vertical intercept will be _____________

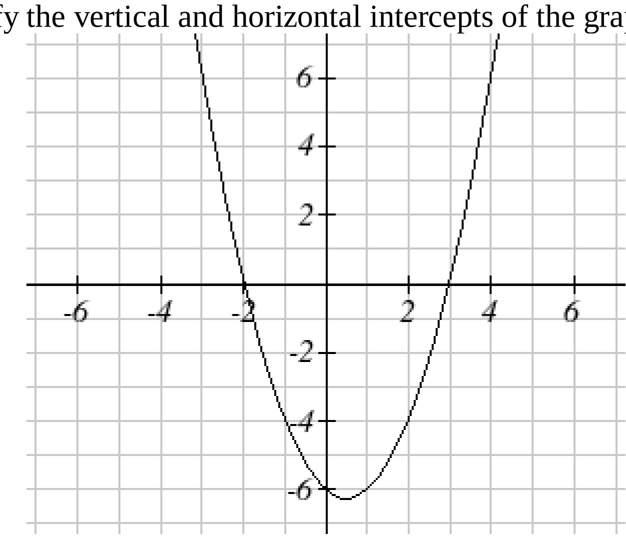
The **horizontal intercept** is the point at which the graph crosses the horizontal axis.



The output value of the horizontal intercept is always_________

The coordinates of the horizontal intercept will be ___________

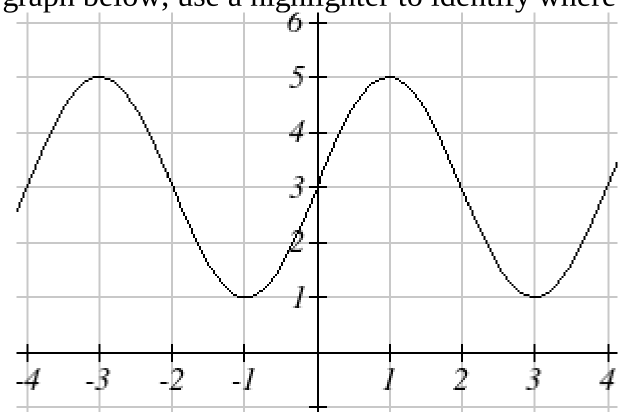
Example 1: Identify the vertical and horizontal intercepts of the graph below.



Behavior of Graphs
A graph is **increasing** if as the inputs increase, the outputs increase. A graph is **decreasing** if as the inputs increase, the outputs decrease. A graph is **constant** if as the inputs increase, the outputs do not change.

Increasing	Decreasing	Constant

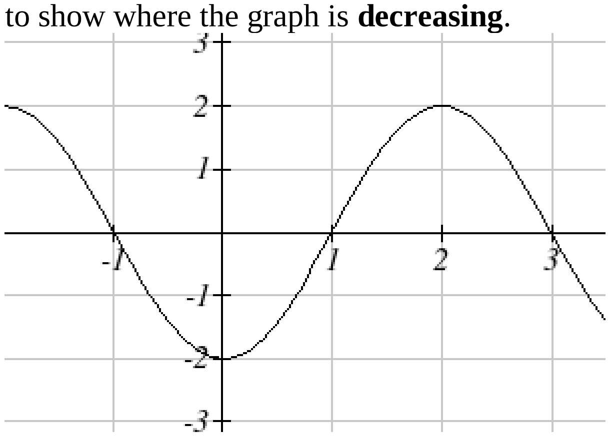
Example 2: On the graph below, use a highlighter to identify where the graph is **increasing.**



Section 5.3 – You Try

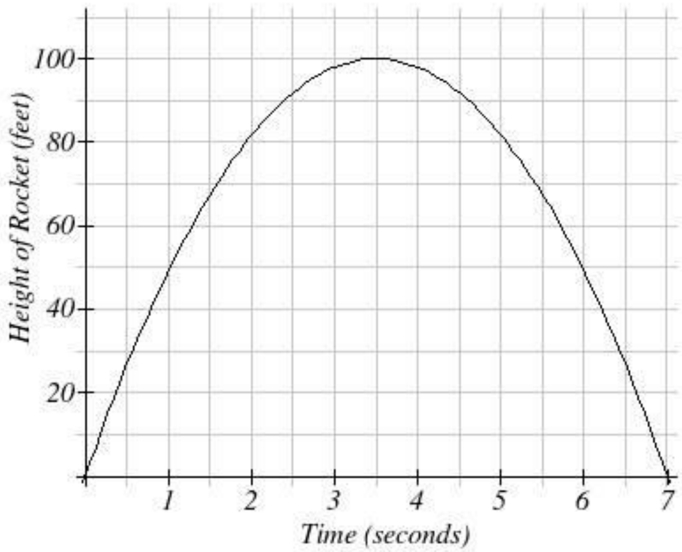
Consider the graph below.

a. Identify the vertical and horizontal intercepts of the graph. Mark these points on the graph and label them as ordered pairs.
b. Use a highlighter to show where the graph is **decreasing**.



Section 5.4: Interpreting a Graph

Example 1: Consider the graph shown below.



Input Variable: ________________

Units of Input Variable: __________

Output Variable: ______________

Units of Output Variable: __________

a. After 3.5 seconds, the rocket is ___________ feet above the ground.

b. The rocket is 50 feet above the ground after ________________________ seconds.

c. Interpret the meaning of the ordered pair (5,82).

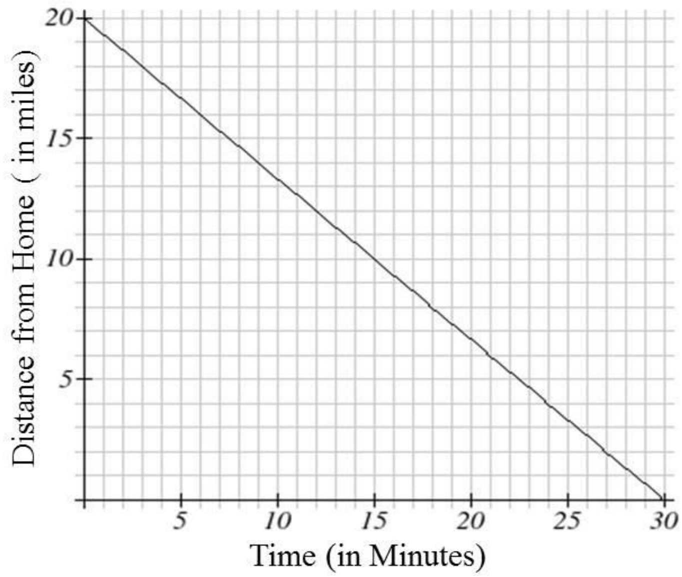
d. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

e. Identify the horizontal intercepts. Write them both as ordered pairs and interpret their meaning in a complete sentence.

f. Use a highlighter to show where the graph is **increasing**, and explain what this means in terms of the rocket.

Section 5.4 - You Try

The graph below shows Sally's distance from home over a 30 minute time period.



Input Variable: ________________

Units of Input Variable: __________

Output Variable: _______________

Units of Output Variable: __________

a. Interpret the meaning of the ordered pair (15,10)

b. After 3 minutes, Sally is ___________ miles from home.

c. After ________ minutes, Sally is 4 miles from home.

d. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning.

e. Identify the horizontal intercept. Write it as an ordered pair and interpret its meaning.

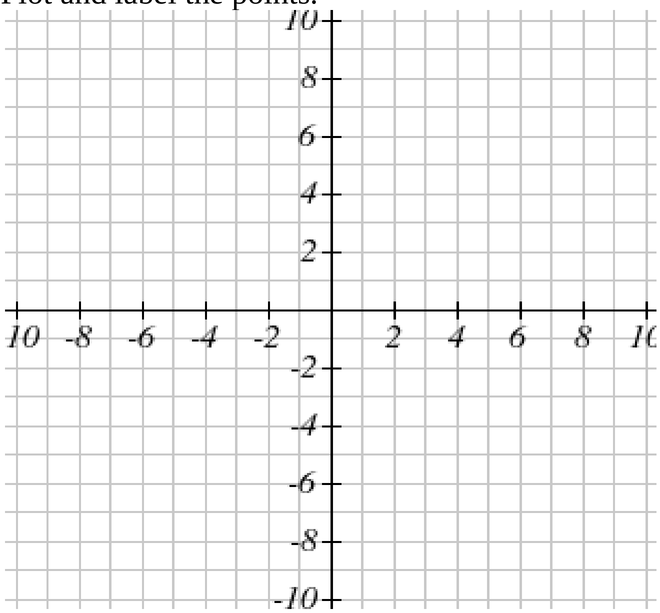
f. This graph is (circle one) **increasing** **decreasing**

Explain what this means in terms of Sally's distance from home.

Unit 5: Practice Problems

Skills Practice

1. Plot and label the points.



A. (8, 2)

B. (0, 0)

C. (0, 5)

D. (10, –10)

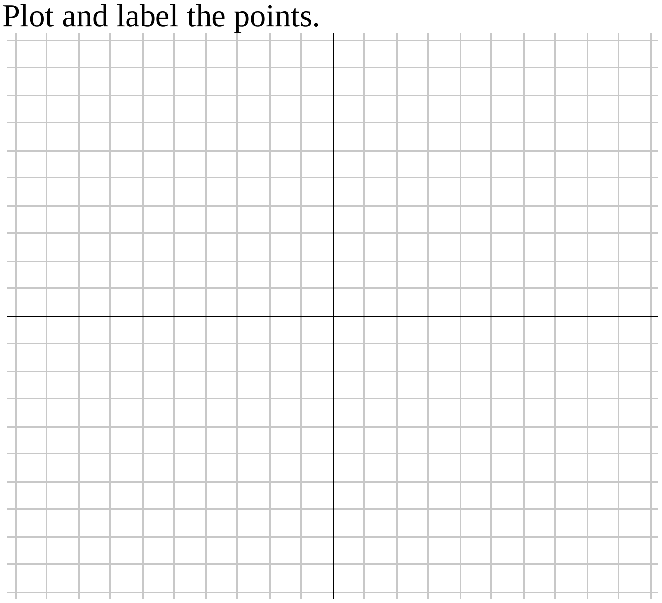
E. (–4, 4)

F. (–9, –1)

G. (–5, 0)

H. (2, –8)

2. Plot and label the points.



A. (–800, 15)

B. (650, 20)

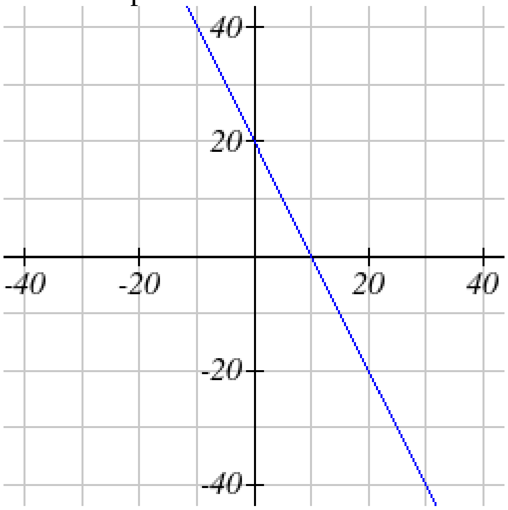
C. (100, 0)

D. (0, –35)

E. (–450, –40)

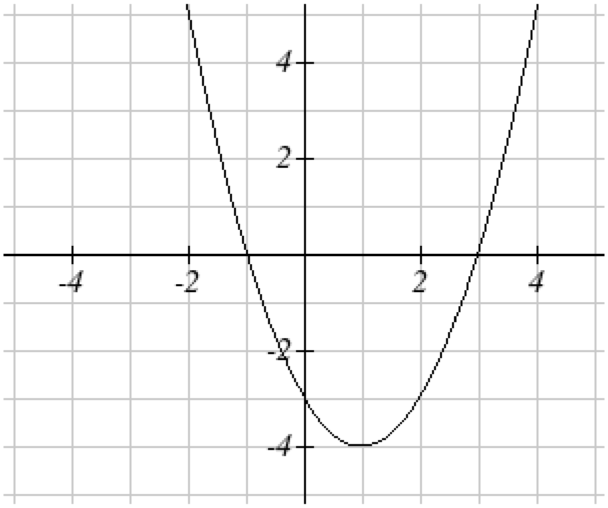
F. (950, –30)

3. Identify the vertical and horizontal intercepts of each of the graphs below. Write the intercepts as ordered pairs.



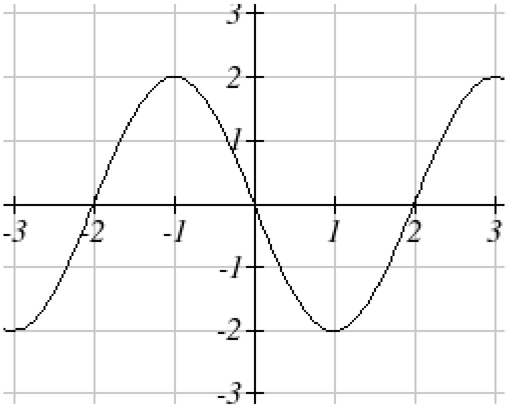
Vertical Intercept:

Horizontal Intercept:



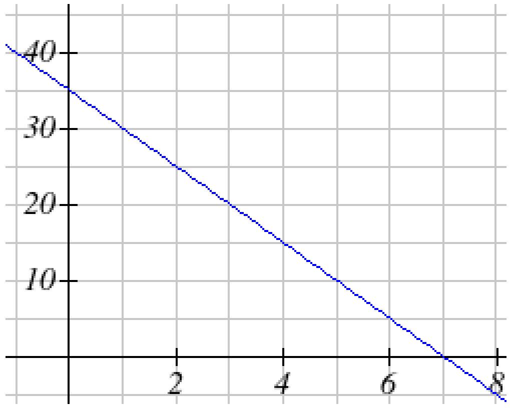
Vertical Intercept:

Horizontal Intercepts:



Vertical Intercept:

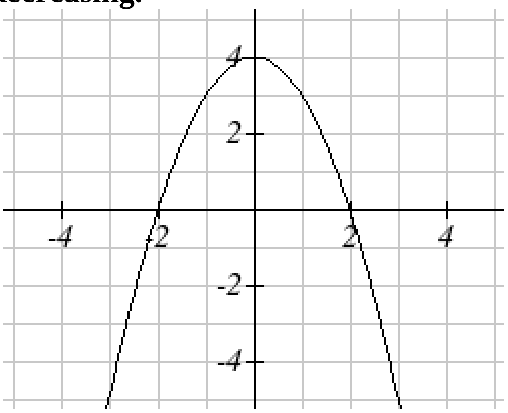
Horizontal Intercepts:

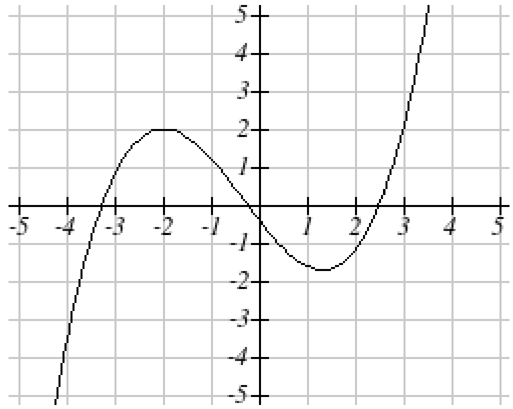


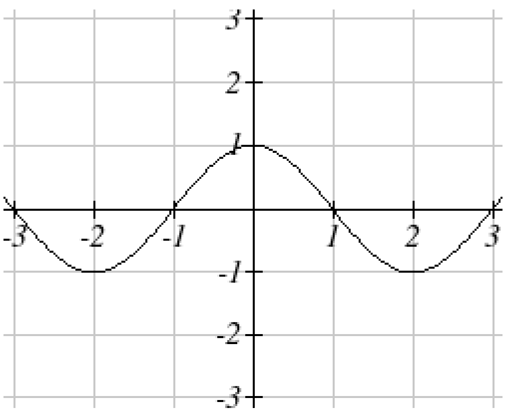
Vertical Intercept:

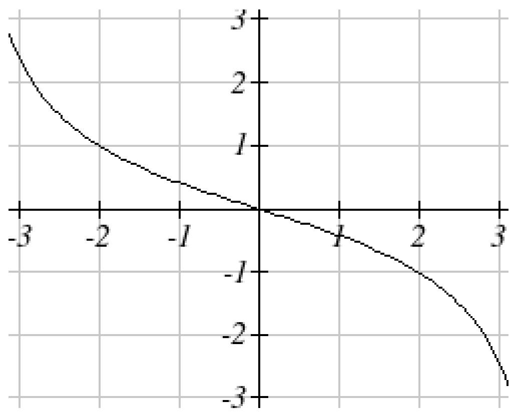
Horizontal Intercept:

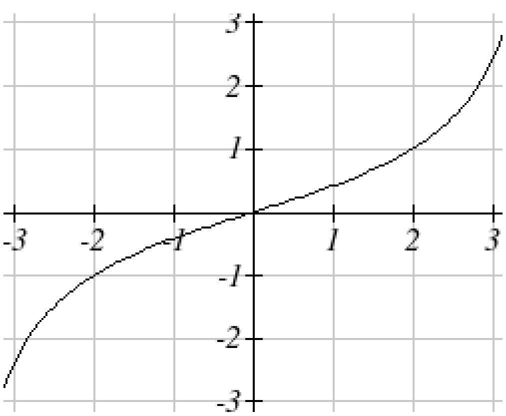
4. For each of the graphs below, use a highlighter to indicate the intervals where the graph is **decreasing.**

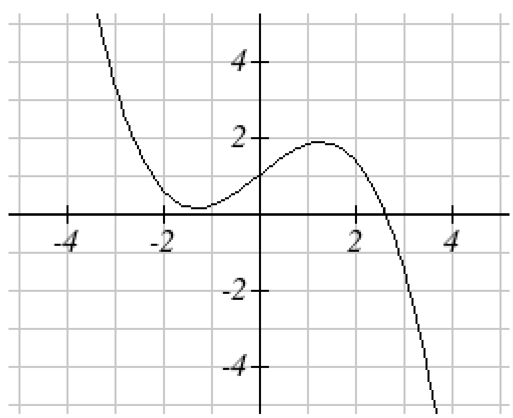






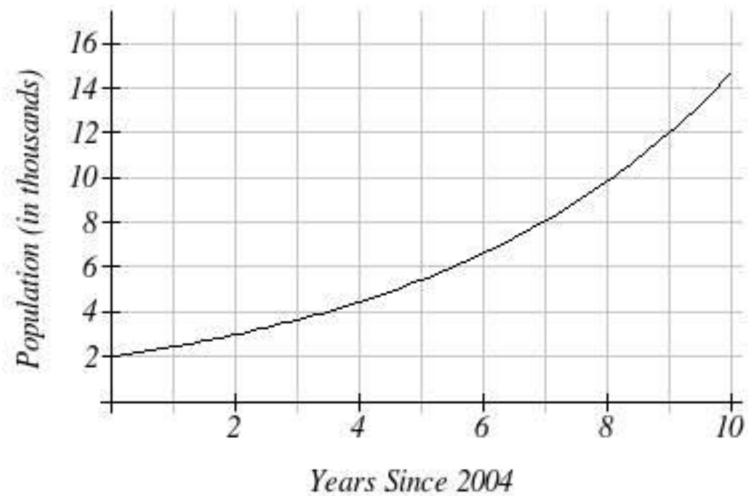






Applications

5. The graph below shows the population of a town over a 10-year time period.



a. What is the input variable? ____________________________

b. What is the output variable? ___________________________

c. The population of this town is (circle one) **increasing** **decreasing**

d. The population of this town in the year 2006 was approximately ________________.

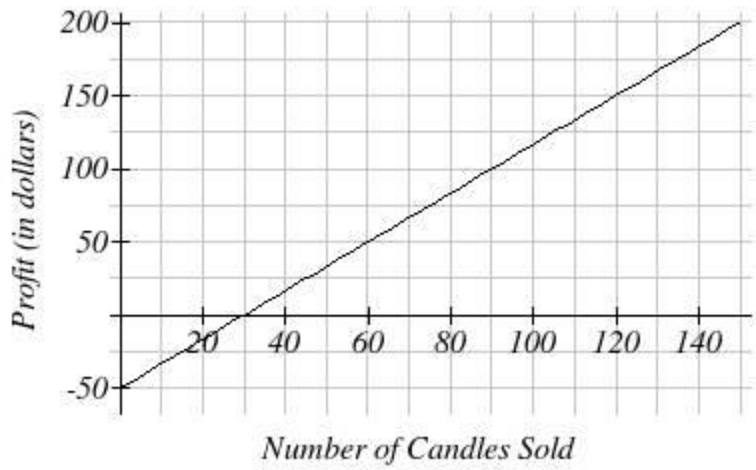
e. The population of this town in the year 2011 was approximately ________________.

f. The population of this town in the year _________ was approximately 10,000 people.

g. Interpret the meaning of the ordered pair (9, 12).

h. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

6. Janey is selling homemade scented candles. The graph below shows her profit from selling the candles.



a. What is the input variable? ____________________________

b. What is the output variable? ___________________________

c. If Janey sells 90 candles, her profit will be _____________.

d. If Janey sells __________ candles, her profit will be $200.

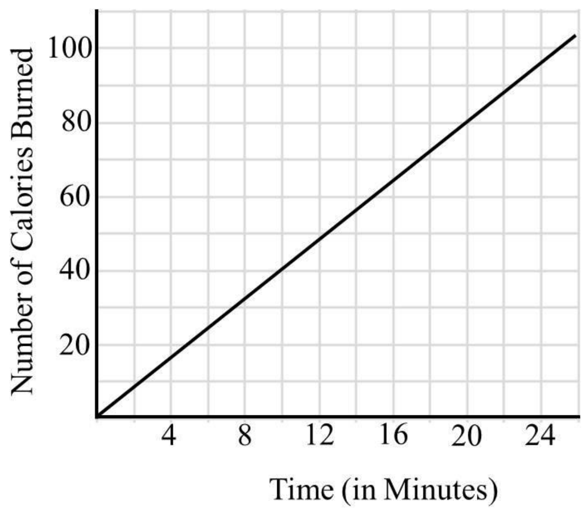
e. If Janey sells 15 candles, her profit will be ____________.

f. Interpret the meaning of the ordered pair (60, 50).

g. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

h. Identify the horizontal intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

7. The graph below shows the number of calories burned while riding a stationary bike.



a. What is the output variable? ____

b. Interpret the meaning of the ordered pair (8, 32).

c. ___________ calories are burned in 10 minutes.

d. 60 calories are burned in ____________ minutes.

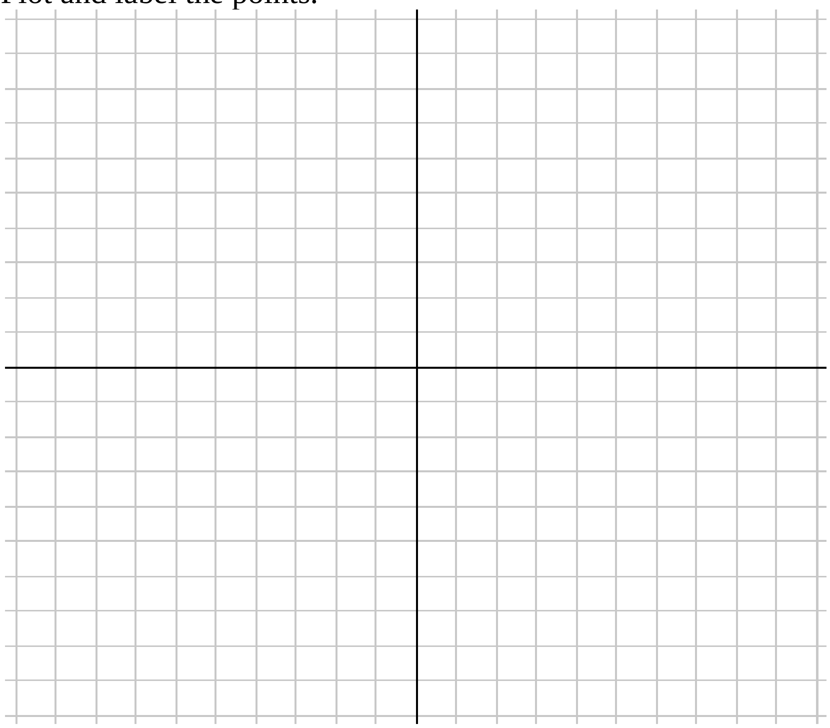
e. ___________ calories are burned in 16 minutes.

f. 100 calories are burned in ___________minutes.

g. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

Unit 5: Review

1. Plot and label the points.



A. (25, 2.5)

B. (40, –0.5)

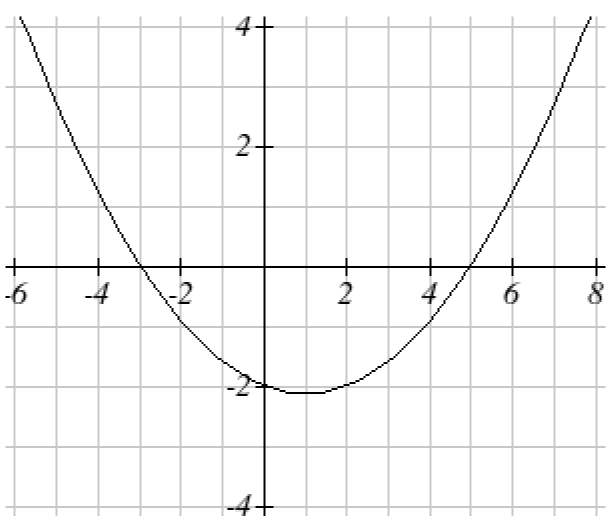
C. (0, –3)

D. (15, 0)

E. (–45, 4)

F. (–30, –1.5)

2. Consider the graph below.
   a. Identify the vertical and horizontal intercepts of the graph.   Mark these points on the graph and label them as ordered pairs.
   b. Use a highlighter to show where the graph is **increasing**.



3. Consider the following data set.

Years Since 1980	Sales (in millions of dollars)
0	3.2
5	2.4
10	1.5
15	1.3
21	1.1
25	2.6
26	3.5

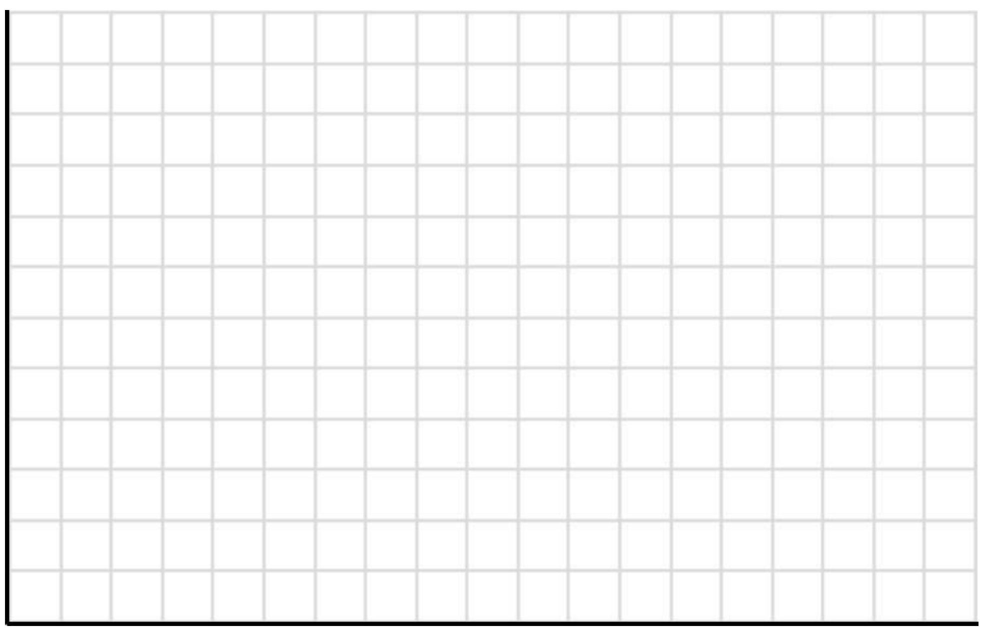
a. What is the input variable? ____

b. What is the output variable? ____

c. What were the sales in 1995?______________________________

d. In a complete sentence, interpret the meaning of the ordered pair (0, 3.2).

e. Use the values in the table to construct a properly scaled and labeled graph of the data.



Unit 6: Formulas and Patterns

Unit 6 Notes

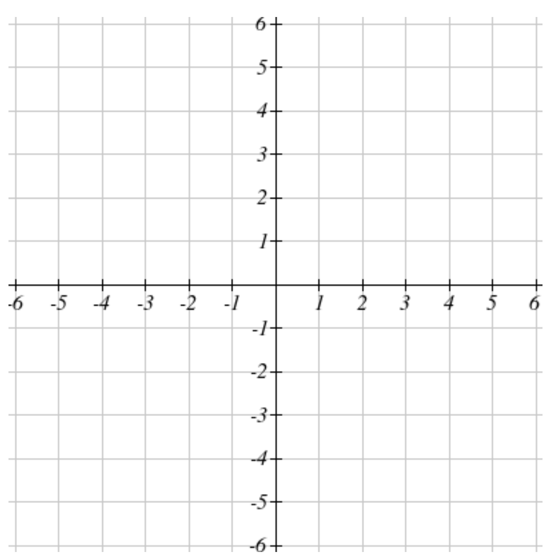
Unit 6: Video Lesson

Section 6.1: Equations and Graphs

Definition
The **graph of an equation** is the set of all points for which the equation is true.

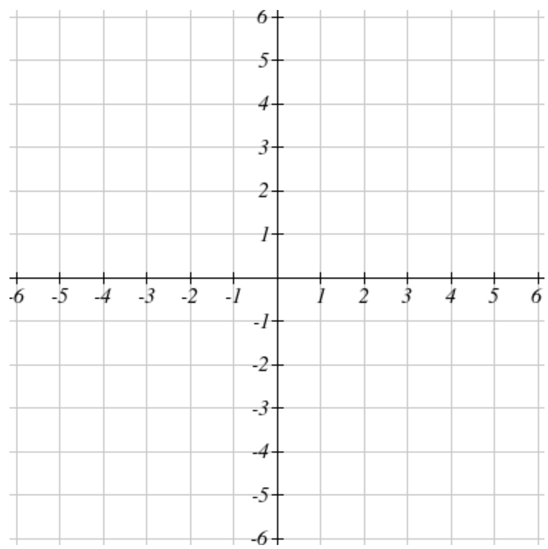
Example 1: Verify that the ordered pairs below satisfy the equation $y = 2x + 3$.

(–2, –1) (0, 3) (1, 5)



Example 2: Verify that the ordered pairs below satisfy the equation $3x + 2y = 6$.

(–2, 6) (0, 3) (2, 0)



Section 6.1 – You Try

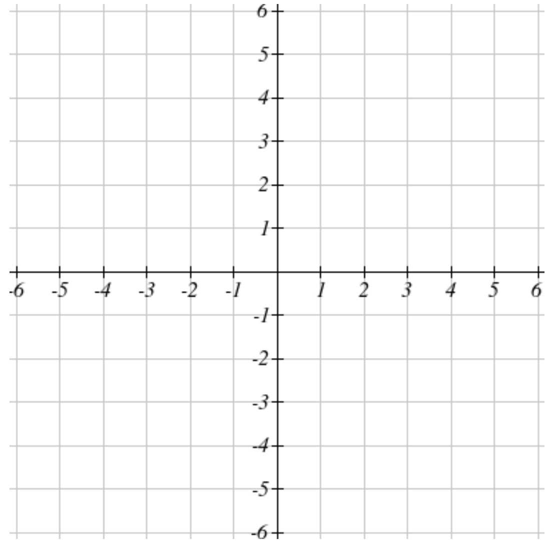
Verify that the ordered pairs below satisfy the equation $y = 2x - 5$. Show all steps as in the media examples.

(–3, –11) (4, 13) (0, –5)

Section 6.2: Graphing Equations by Plotting Points

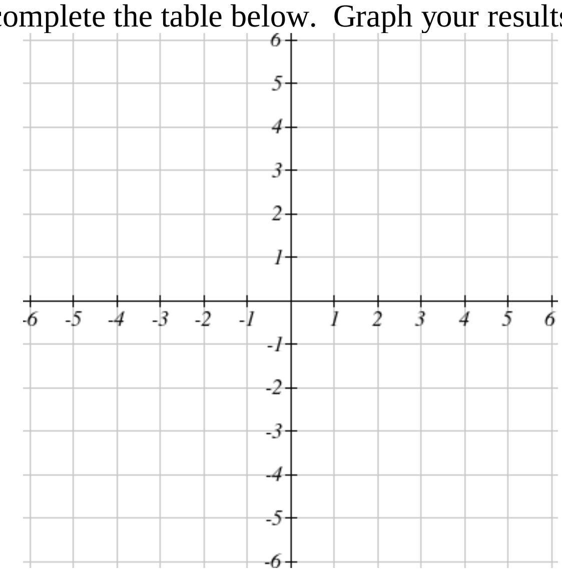
Example 1: Use the equation $y = \frac{1}{2}x - 2$ to complete the table below. Graph your results.

x	y	Ordered Pair
-6		
-4		
-2		
0		
2		
4		
6		



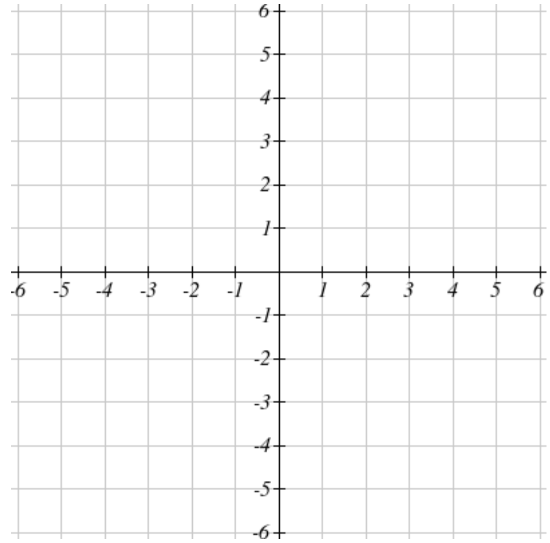
Example 2: Use the equation $y = -x^2 + 5$ to complete the table below. Graph your results.

x	y	Ordered Pair
-3		
-2		
-1		
0		
1		
2		
3		



Example 3: Use the equation $y = 2^x$ to complete the table below. Graph your results.

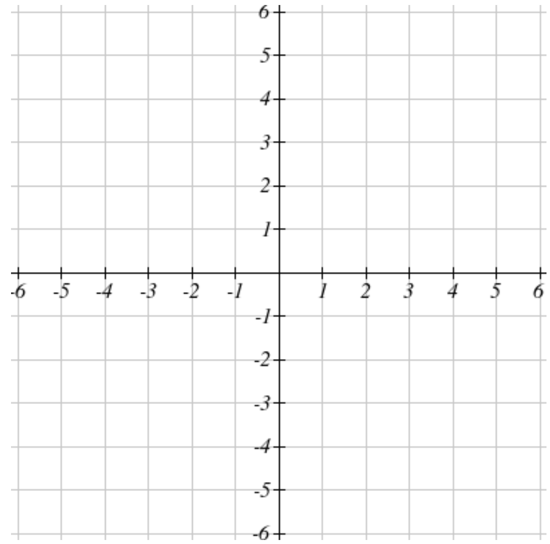
x	y	Ordered Pair
-2		
-1		
0		
1		
2		
3		



Section 6.2 – You Try

Use the equation $y = -x$ to complete the table below. Graph your results.

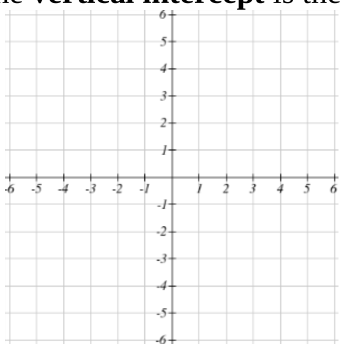
x	y	Ordered Pair
-6		
-4		
-2		
0		
2		
4		
6		



Section 6.3: Intercepts

Vertical and Horizontal Intercepts

The **vertical intercept** is the point at which the graph crosses the vertical axis.

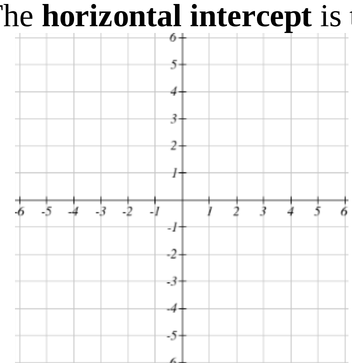


The input value of the vertical intercept is always____________

The coordinates of the vertical intercept will be _____________

To determine the vertical intercept:

The **horizontal intercept** is the point at which the graph crosses the horizontal axis.



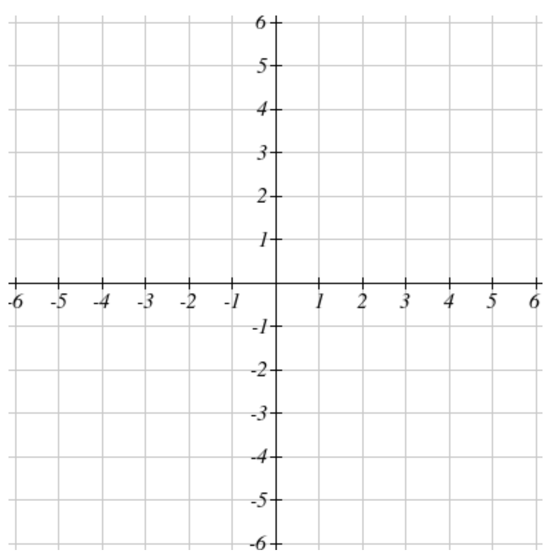
The output value of the horizontal intercept is always_________

The coordinates of the horizontal intercept will be ___________

To determine the horizontal intercept:

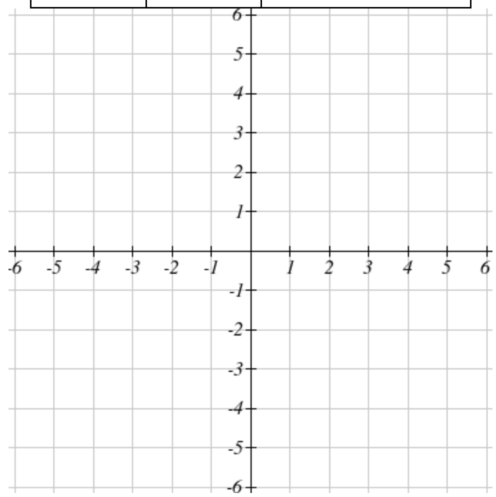
Example 1: Determine the vertical and horizontal intercepts for $y = 3x - 2$.

x	Y	Ordered Pair



Example 2: Determine the vertical and horizontal intercepts for $4x - 2y = 10$.

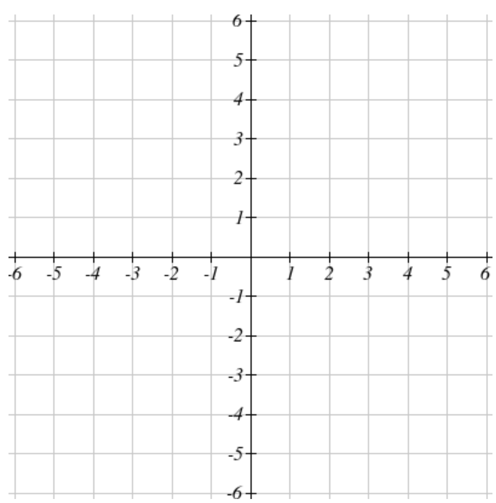
x	Y	Ordered Pair



Section 6.3 - You Try

Determine the vertical and horizontal intercepts for $y = 24 - 6x$

x	Y	Ordered Pair

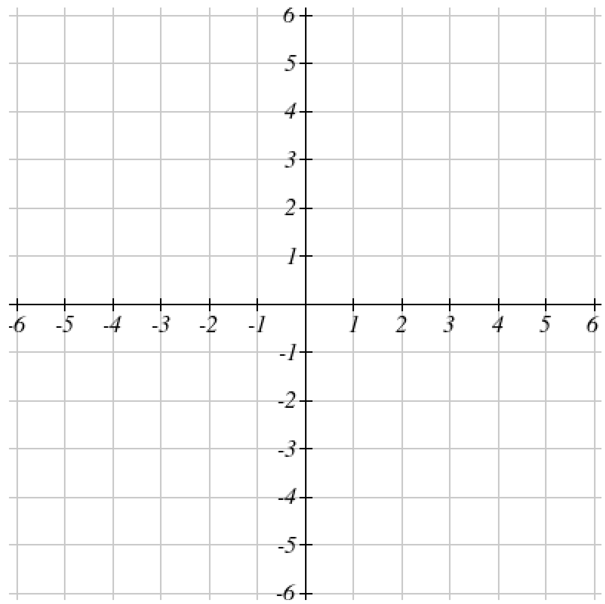


Section 6.4: Horizontal and Vertical Lines

Horizontal Lines $y = b$, where b is a real number

Example 1: Graph the equation $y = 2$

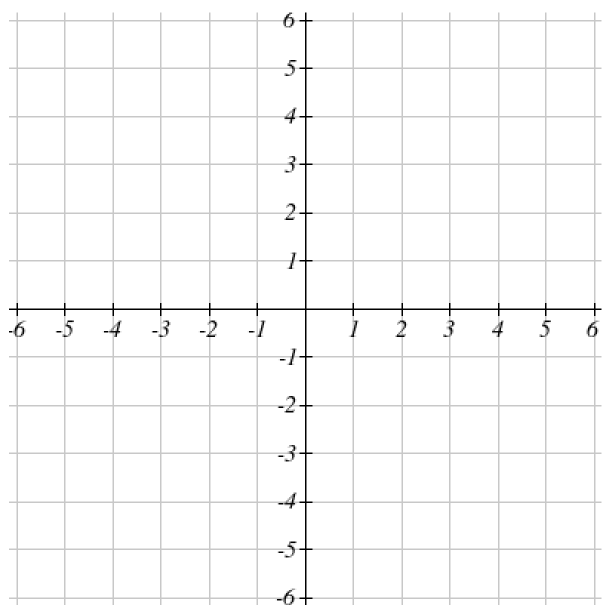
x	y	Ordered Pair



Vertical Lines $x = k$, where k is a real number

Example 2: Graph the equation $x = –3$

x	y	Ordered Pair

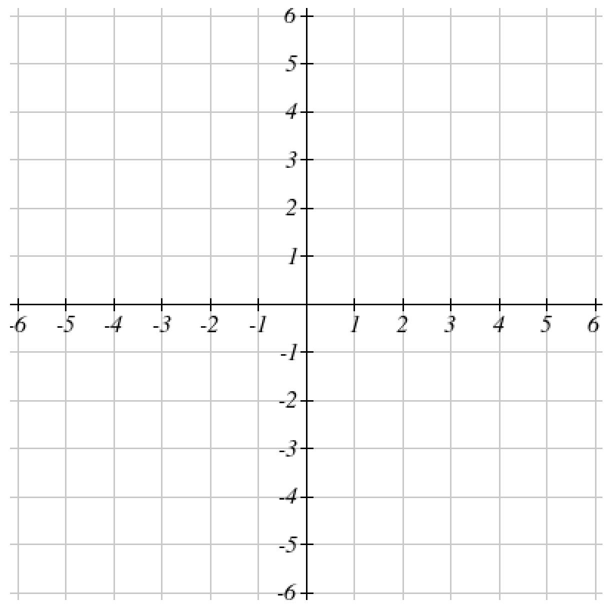


Section 6.4 - You Try

Complete the problems below.

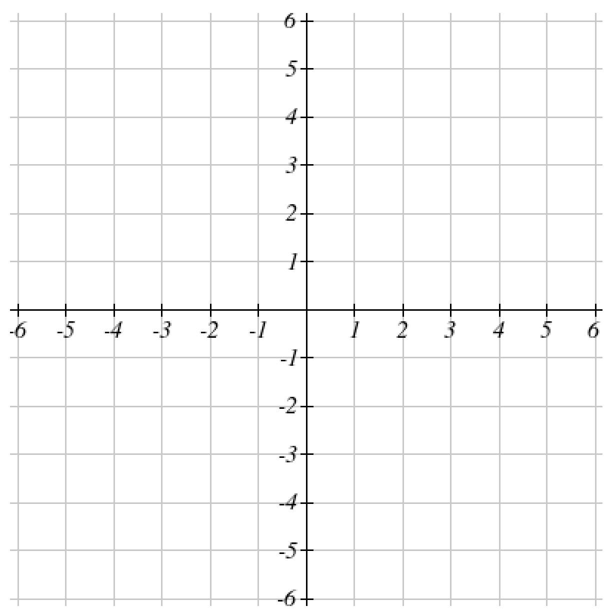
a. Graph the equation $y = -2$

x	y	Ordered Pair



b. Graph the equation $x = 4$

x	y	Ordered Pair



Unit 6: Practice Problems

Skills Practice

1. Which of the following ordered pairs satisfy the equation $y = -2x - 4$? **Circle all that apply, and show all supporting work.**

(9, –22) (6, –5) (–9, 14) (2, 0) (–4, 0)

2. Which of the following ordered pairs satisfy the equation $3x - 2y = 8$? **Circle all that apply, and show all supporting work**

(2, –1) (–4, 0) (1, 8) (–2, –7) (–16, –8)

3. Which of the following ordered pairs satisfy the equation $y = 1 - x$. **Circle all that apply, and show all supporting work**

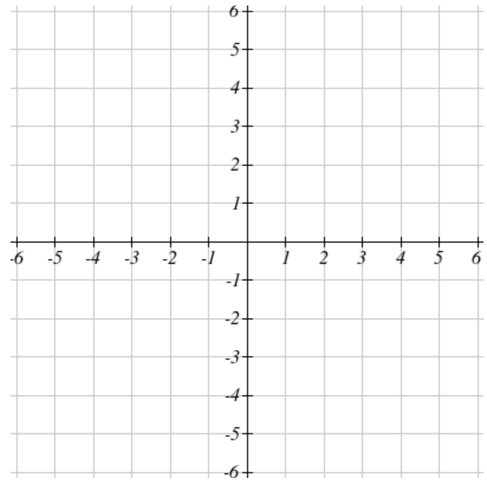
(–7, 8) (0, 1) (3, –2) (–1, 0) (–20, 21)

4. Which of the following ordered pairs satisfy the equation $y = -2x$. **Circle all that apply, and show all supporting work**

(6, –12) (–1, 2) (4, –8) (0, –2) (0, 0)

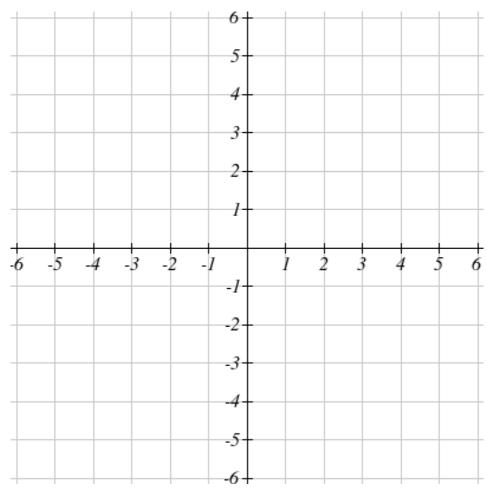
5. Graph the equation $y = -4x + 2$.

x	y	Ordered Pair



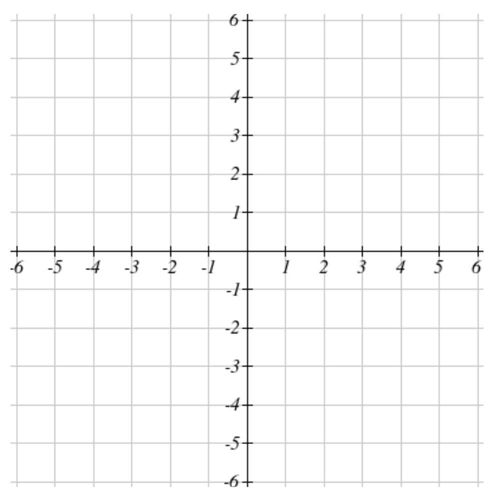
6. Graph the equation $y = \frac{2}{5}x - 3$

x	y	Ordered Pair



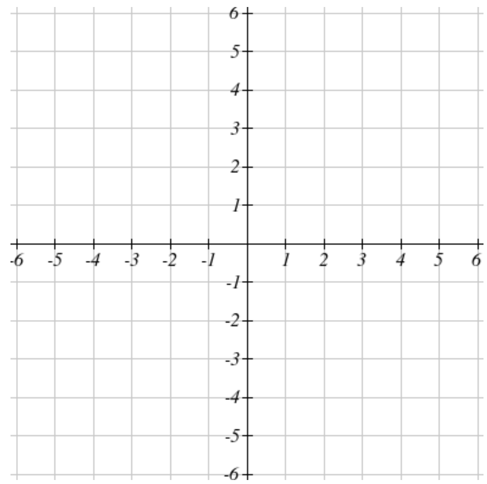
7. Graph the equation $y = 3 - x$.

x	y	Ordered Pair



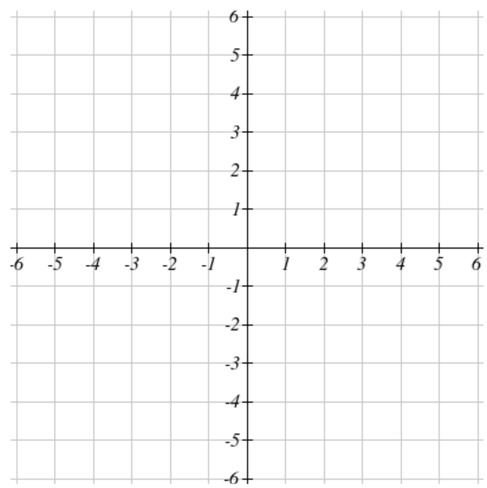
8. Graph the equation $4x - 2y = 12$.

x	y	Ordered Pair



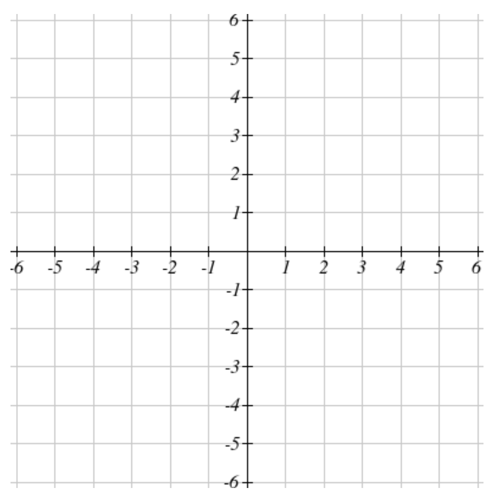
9. Graph the equation $x - y = 4$.

x	y	Ordered Pair



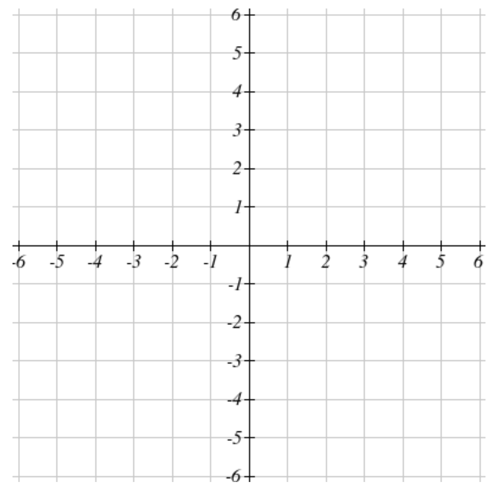
10. Graph the equation $y = x$.

x	y	Ordered Pair



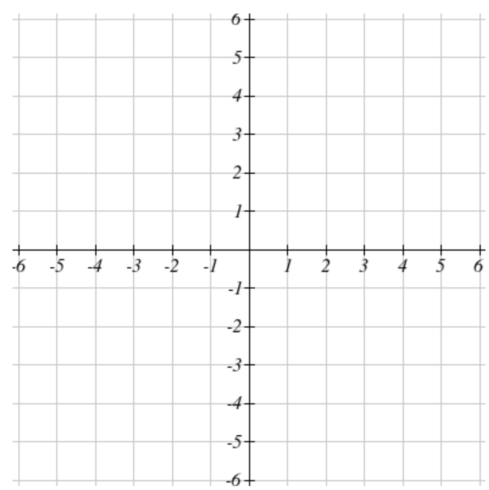
11. Graph the equation $y = \frac{2}{3}x$.

x	y	Ordered Pair



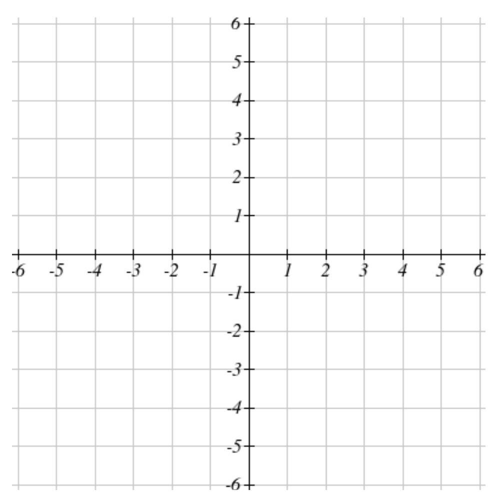
12. Graph the equation $y = -4$.

x	y	Ordered Pair



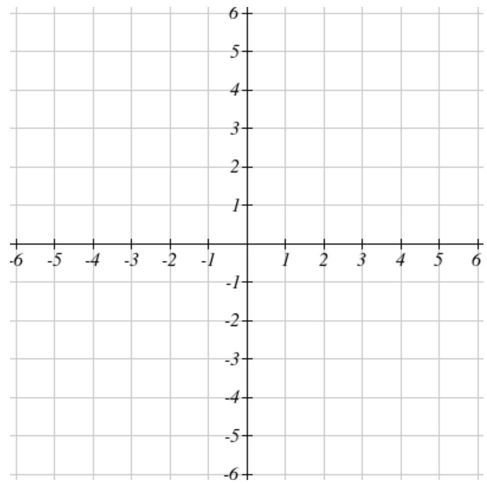
13. Graph the equation $x = 3$

x	y	Ordered Pair



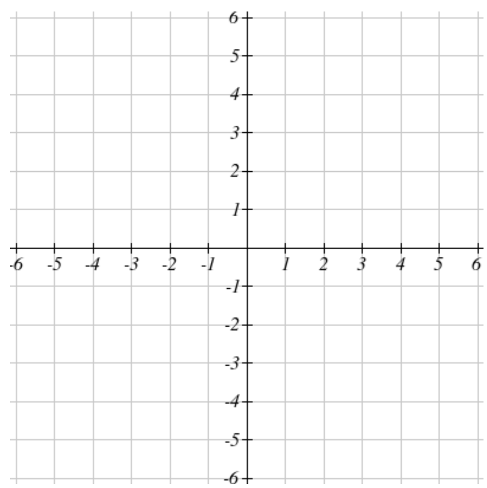
14. Graph the equation $y = 5 - x^2$

x	y	Ordered Pair
-3		
-2		
-1		
0		
1		
2		
3		



15. Graph the equation $y = x - 1$

x	y	Ordered Pair



16. Complete the table below. Write the intercepts as ordered pairs.

Equation	Vertical Intercept	Horizontal Intercept
$y = 5x - 3$		
$y = 4 - x$		
$y = 4x$		
$y = 3$		
$5x + 6y = 12$		
$3x - 4y = 24$		
$x - 2y = 8$		
$x = 5$		

Applications

17. Jordan is saving money for emergencies (or a trip to Europe). She has $420 under her mattress, and is adding $60 to it each week.

a. Let A represent the total amount of money under her mattress, and w represent the number of weeks. Write an algebraic equation to represent this situation.

b. Use the equation in part a. to complete the table below.

w	0	8			37	
A			1800	2220		3000

c. Interpret the meaning of the ordered pair (18, 1500).

d. Identify the vertical intercept in this situation. Write it as an ordered pair and interpret its meaning in a complete sentence.

e. How much money will Jordan have saved after 3 weeks?

f. How many weeks will it take for Jordan to save at least $1000?

18. Jill is planning to sell bottled water at the local carnival. She buys 10 packages of water (240 bottles) for \$66 and plans on selling the bottles for \$1.50 each. Jill's profit, P in dollars, from selling b bottles of water is given by the formula $P = 1.50b - 66$.

a. Complete the table below.

b	0	50	100	200	240
P					

b. Interpret the meaning of the ordered pair (84, 60).

c. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

d. Determine the horizontal intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

b. Use the values in the table to construct a properly scaled and labeled graph of this equation.

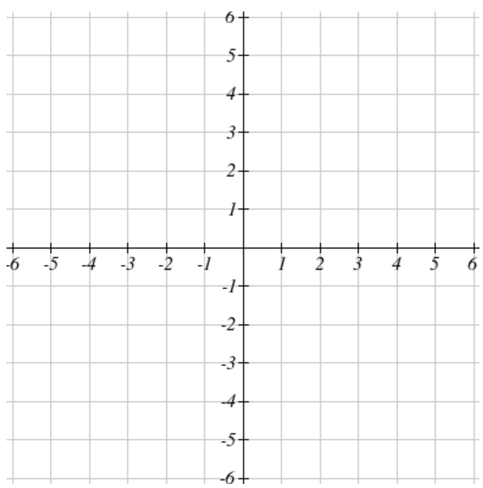
Unit 6: Review

1. Which of the following ordered pairs satisfy the equation $y = x^2 - 3$. **Circle all that apply, and show all supporting work**

(1, 2) (4, 13) (–3, –9) (–5, 22)

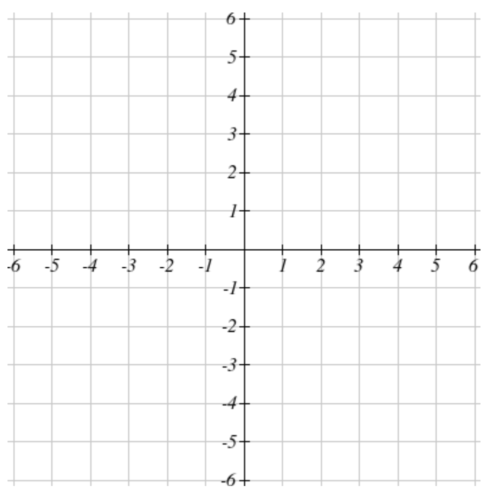
2. : Determine the vertical and horizontal intercepts for $2x - y = 6$.

x	Y	Ordered Pair



3. Graph the equation $x = -2$

x	y	Ordered Pair



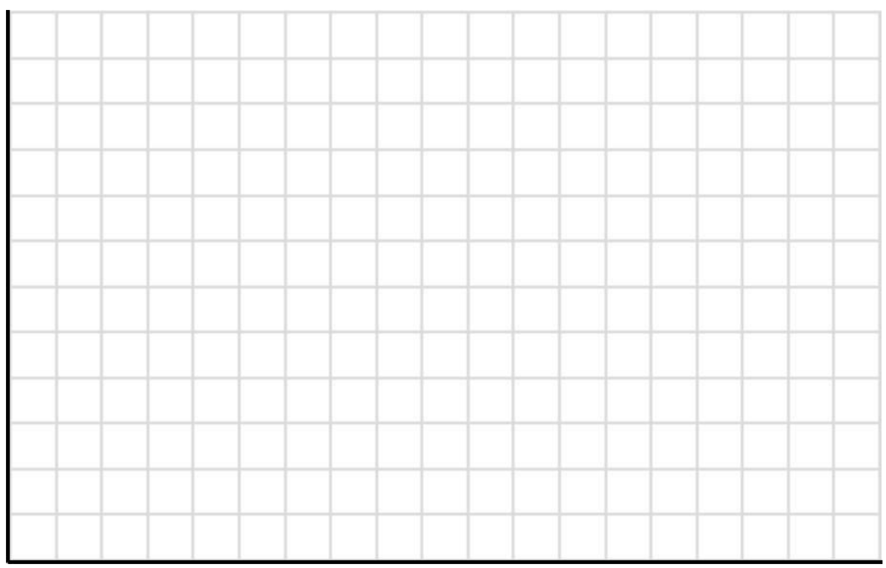
4. The maximum heart rate is the highest heart rate achieved during maximal exercise. In general, you get the most benefits and reduce the risks when you exercise near your *target* heart rate. Usually this is when your exercise heart rate (pulse) is about 80% percent of your maximum heart rate. For adults 19 years of age and older, the formula $T = 176 - 0.8a$, gives the target heart rate, T, in beats per minute, for a person who is a years of age.

a. Complete the table below.

Age (years)	20	25	38		70
Target Heart Rate (bpm)	160	156	145.6	132	

b. In a complete sentence, interpret the meaning of the ordered pair (25, 156).

c. Use the values in the table to construct a properly scaled and labeled graph of this equation.



Unit 7: Introduction to Functions

Unit 7 Notes

Unit 7: Video Lesson

Section 7.1: Relations and Functions

Definitions

A **RELATION** is any set of ordered pairs.

A **FUNCTION** is a relation in which **every** input value is paired with **exactly one** output value

Table of Values

One way to represent the relationship between the input and output variables in a relation or function is by means of a table of values.

Example 1: Which of the following tables represent functions?

Input	Output
1	5
2	5
3	5
4	5

Yes No

Input	Output
1	8
2	–9
3	7
3	12

Yes No

Input	Output
2	4
1	–5
4	10
–3	–87

Yes No

Ordered Pairs

A relations and functions can also be represented as a set of points or ordered pairs.

Example 2: Which of the following sets of ordered pairs represent functions?

A = {(0, –2), (1,4), (–3,3), (5,0)}

B = {(–4,0), (2, –3), (2, –5)}

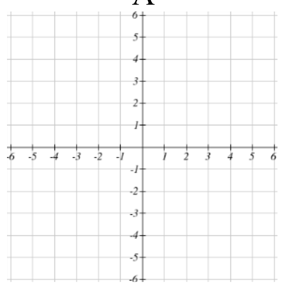
C = {(–5,1), (2,1), (–3,1), (0,1)}

D = {(3, –4), (3, –2), (0, 1), (2, –1)}

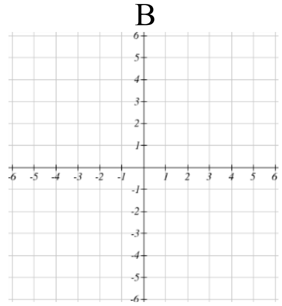
E = {(1,3)}

Example 3: On the graphs below, plot the points for A, B, C, and D from Example 2, then circle the "problem points"

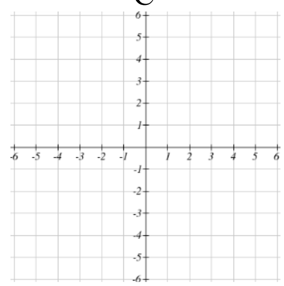
A



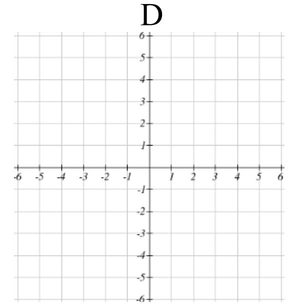
B



C

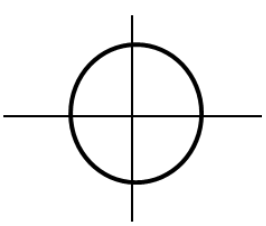


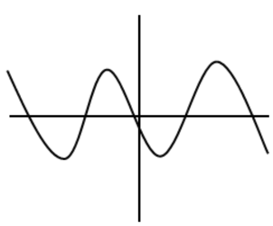
D

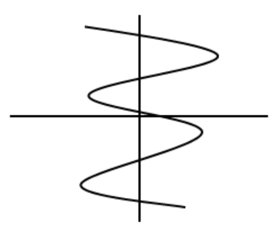


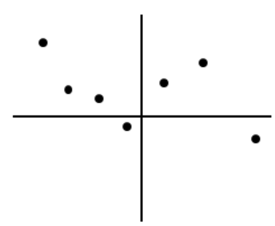
The Vertical Line Test
• If all vertical lines intersect the graph of a relation at no more than one point, the relation *is* also a function. One and only one output value exists for each input value. • If any vertical line intersects the graph of a relation at more than one point, the relation "fails" the test and is NOT a function. More than one output value exists for some (or all) input value(s).

Example 4: Use the Vertical Line Test to determine which of the following graphs are functions.









Behavior of Graphs

Increasing	Decreasing	Constant

Dependent and Independent Variables

In general, we say that the output **depends** on the input.

Output variable = **Dependent Variable**

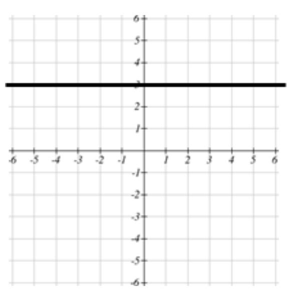
Input Variable = **Independent Variable**

If the relation is a function, then we say that the output **is a function of** the input.

Section 7.1 – You Try

Is it a function? Circle "Yes" or "No" for each of the following.

Yes or No



Yes or No

Input	Output
4	12
6	14
8	14
10	16

Yes or No

(2, –3), (–5, 2), (–3, 1)

Section 7.2: Function Notation: f (input) = output

If a relation is a function, we say that the *output is a function of the input.*

Function Notation: f (input) = output

Example: If y is a function of x, then we can write $f(x) = y$.

Example 1: The function V(m) represents value of an investment (in thousands of dollars) after m months. Explain the meaning of V(36) = 17.4.

Ordered Pairs

Example 2:

Ordered Pair (input, output)	Function Notation f (input) = output
(2, 3)	$f(2) = 3$
(–4, 6)	f (____) = _____
(______ , ______)	$f(5) = -1$

Example 3: Consider the function: $f = \{(2, -4),\ (5, 7),\ (8, 0),\ (11, 23)\}$

$f(5)$ = __________ f(______) = 0

Table of Values

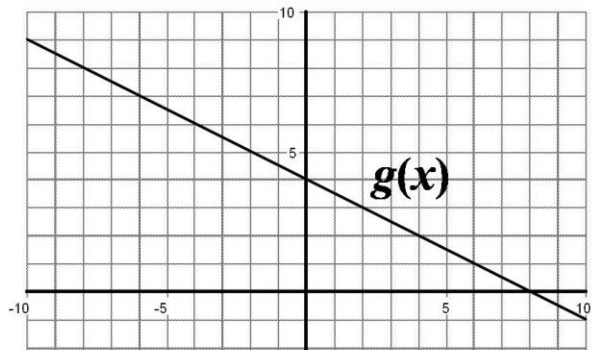
Example 4: The function $B(t)$ is defined by the table below.

t	1	3	12	18	22	31
***B*(*t*)**	70	64	50	39	25	18

$B(12)$ = ______________________ $B(t) = 18$ when t = ____________________

Graph

Example 5: Consider the graph $g(x)$ of shown below



$g(2)$ = _________ g(______) = 2

Ordered pair:___________ Ordered pair:____________

$g(0)$ = _________ g(______) = 1

Ordered pair:___________ Ordered pair:____________

Section 7.2 –You Try

Complete the problems below.

a. Complete the table.

Ordered Pair	Function Notation
(8, 1)	f (____) = _____
(_____ , _____)	$f(0) = 11$

b. The function $k(x)$ is defined by the following table

x	–2	–1	0	1	2	3	4
$k(x)$	8	2	–9	4	6	1	0

$k(2)$ = _________

Ordered Pair: ___________

$k(x) = 1$ when x = _______

Ordered Pair: ___________

c. At an ice cream factory, the total cost production is a function of the number of gallons of ice cream produced. The function C(g), gives the cost, in dollars, to produce g gallons of ice cream. Explain the meaning of $C(580)=126$ in terms of ice cream production.

Section 7.3: Domain and Range

DEFINITIONS
The **DOMAIN** of a function is the set of all possible values for the **input** variable. The **RANGE** of a function is the set of all possible values for the **output** variable.

DOMAIN AND RANGE

Example 1: Consider the function below

x	–2	0	2	4	6
$k(x)$	3	–7	11	3	8

Input values ____

Domain: {________________________________}

Output values:____

Range: {________________________________}

Example 2: Consider the function: $B = \{(2, –4), \quad (5, 7), \quad (8, 0), \quad (11, 23)\}$

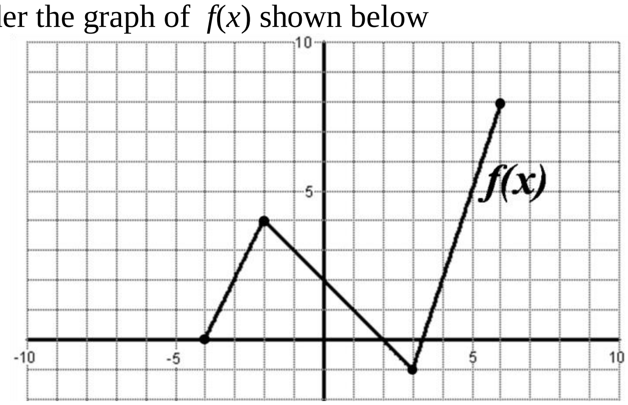
Input values ____

Domain: {________________________________}

Output values:____

Range: {________________________________}

Example 3: Consider the graph of $f(x)$ shown below

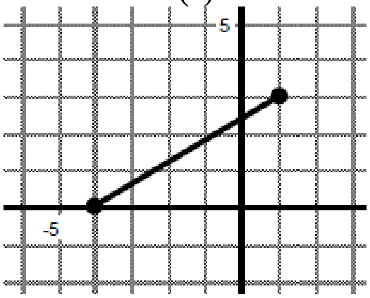


Domain: ________________ $\leq$ $x \leq$ ________________

Range: ________________ $\leq$ $f(x) \leq$ ________________

Example 4: Determine the Domain and Range of each of the following graphs:

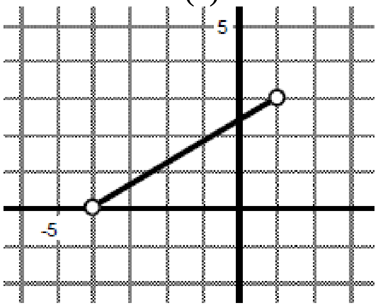
A(x)



Domain

Range

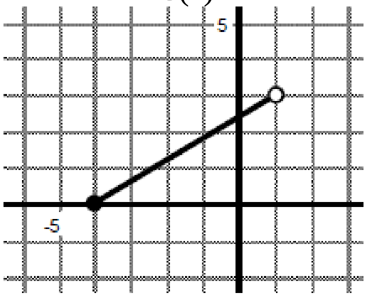
B(x)



Domain

Range

C(x)



Domain

Range

SECTION 7.3 – YOU TRY

Determine the Domain and Range of the functions below.

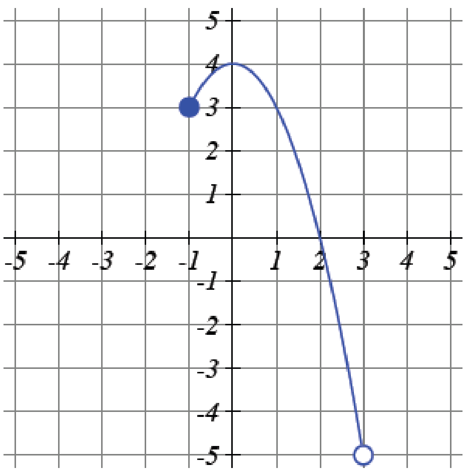
a.

Input	Output
4	12
6	12
8	12
10	12

Domain:

Range:

b. The graph of $f(x)$ is shown below



Domain:

Range:

Section 7.4: Practical Domain and Range

Definitions
The **Practical Domain** of a function is the set of all possible values for the input variable *that make sense* in a given situation. The **Practical Range** of a function is the set of all possible values for the output variable *that make sense* in a given situation.

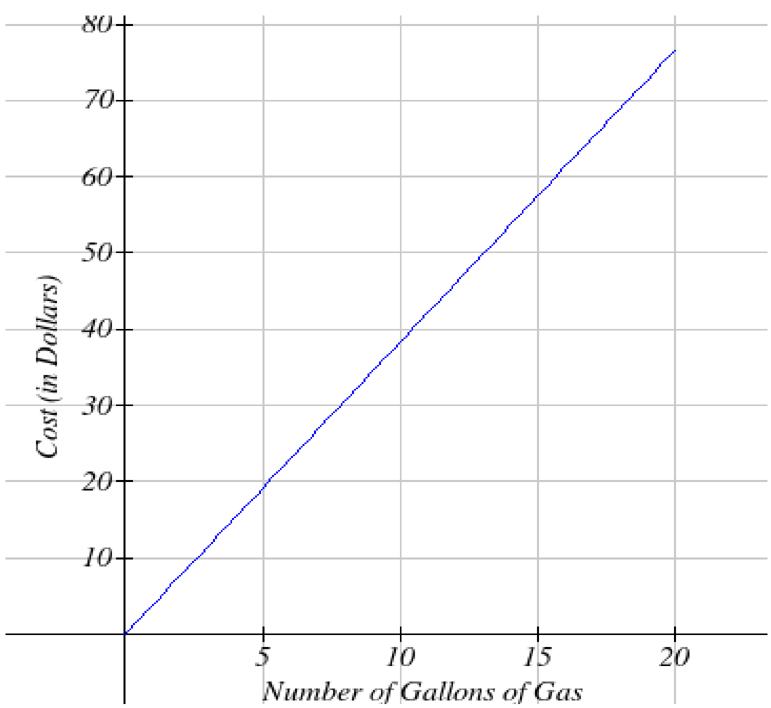
Example 1: The gas station is currently charging $3.83 per gallon for gas. The cost, C(*n*), in dollars, to fill up your car depends on the number of gallons, *n*, that you pump. Your car's tank can hold a maximum of 20 gallons of gas.

a. In this situation, the input variable is ______________________________________.

b. The *practical* domain of this function is ____________________________________.

c. The output variable in this situation is ______________________________________.

d. The *practical* range of this function is ______________________________________.



Section 7.4 – You Try

The platform for the high dive is 35 feet above the water. A diver jumps from the platform and lands in the water after 1.5 seconds. The function H(*s*) represents the height of the diver after *s* seconds.

a. In this situation, the input variable is ______________________________________.

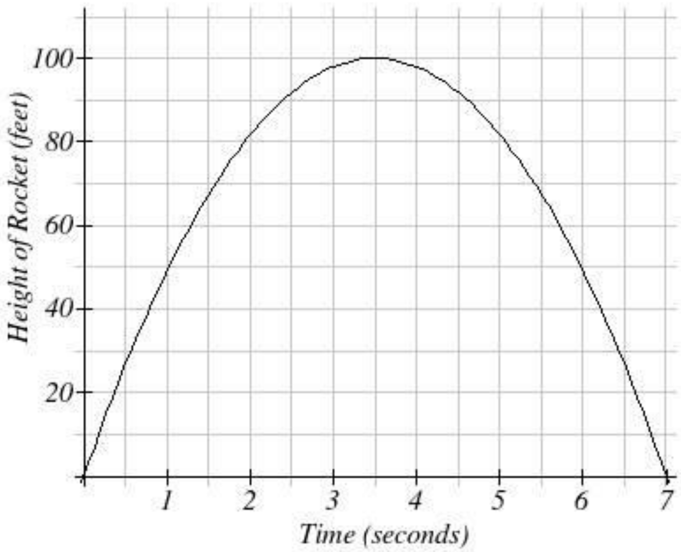
b. The *practical* domain of this function is ____________________________________.

c. The output variable in this situation is ______________________________________.

d. The *practical* range of this function is ______________________________________.

Section 7.5: Applications

Example 1: Consider the graph of the function H(t) shown below.



Input Variable: ________________

Units of Input Variable: __________

Output Variable: ______________

Units of Output Variable: __________

a. Interpret the meaning of the statement H(5)=82.

b. Determine H(7). Write it as an ordered pair and interpret its meaning in a complete sentence.

c. Determine t when H(t) = 50. Write it as an ordered pair and interpret its meaning in a complete sentence.

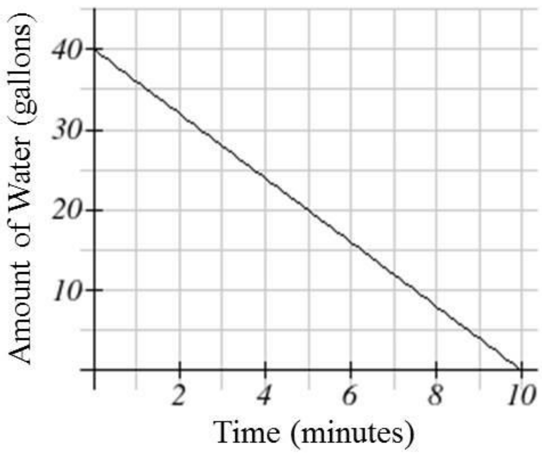
d. Determine the maximum height of the rocket.

e. Determine the practical domain for H(t).

f. Determine the practical range for H(t).

Section 7.5 – You Try

The graph of A(m) below shows the amount of water in a play pool.



Input Variable: ______________________

Units of Input Variable: _______________

Output Variable: ______________________

Units of Output Variable: _______________

a. Interpret the meaning of the statement A(3)=28.

b. Determine A(5). Write it as an ordered pair and interpret its meaning in a complete sentence.

c. Determine t when A(m) = 0. Write it as an ordered pair and interpret its meaning in a complete sentence.

d. Describe what is happening to the water in the pool. (Is the pool being filled or drained?)

e. Determine the practical domain for A(m).

f. Determine the practical range for A(m).

Unit 7: Practice Problems

Skills Practice

1. Are these functions? Circle yes or no.

Input	Output
3	12
7	12
4	12
2	12

Yes No

Input	Output
1	8
2	–9
3	7
3	12

Yes No

Input	Output
2	4
1	–5
4	10
–3	–87

Yes No

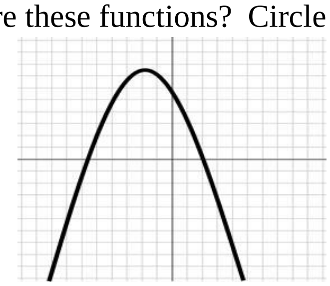
2. Are these functions? Circle yes or no.

   a. {(2, –4), (6, –4), (0, 0), (5, 0)} Yes No

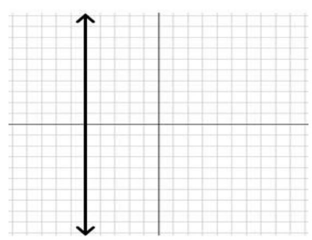
   b. {(1, 1), (2, 2), (3, 3), (4, 4)} Yes No

   c. {(1, –8), (5, 2), (1, 6), (7, –3)} Yes No

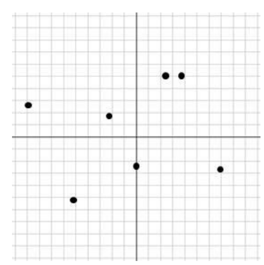
3. Are these functions? Circle yes or no.



Yes **No**



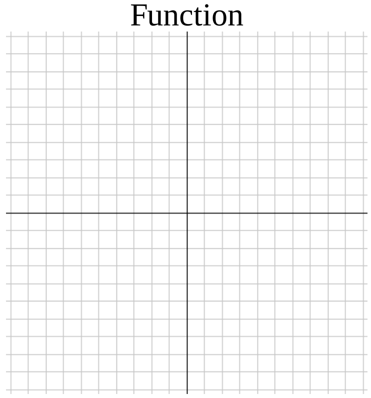
Yes **No**



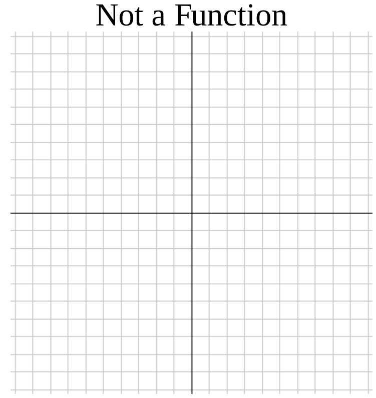
Yes **No**

4. In the space below, draw a graph that represents a function, and a graph that does NOT represent a function.

Function



Not a Function



5. The function $r(x)$ is defined by the following table of values.

x	3	5	6	9	13
$r(x)$	–9	3	2	2	1

a. $r(9)$ = ____________ b. $r(3)$ = ______________

c. $r($ __________ $)$ = 1 d. $r($ ____________ $)$ = 3

e. The domain of $r(x)$ is { ____ }

f. The range of $r(x)$ is { ____ }

6. Consider the function g = {(2, 5), (0, 6), (5, 8), (–3, 7)}

a. $g(0)$ = ____________ b. $g(5)$ = ______________

c. $g($ __________ $)$ = 7 d. $g($ ____________ $)$ = 5

e. The domain of g is { ____ }

f. The range of g is { ____ }

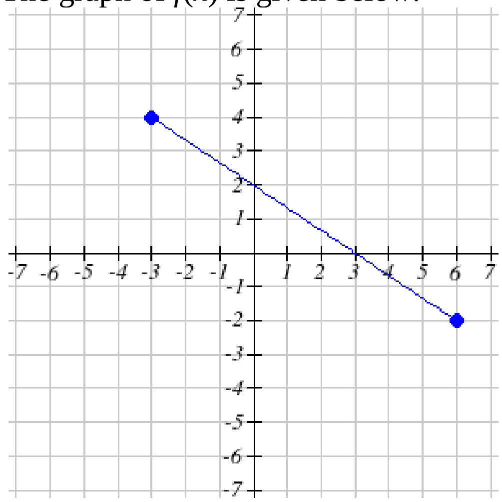
7. Given $f(4) = 8$, $f(3) = 11$, $f(0) = 6$

a. The domain of f is { ____ }

b. The range of f is { ____ }

c. Write the function f as a set of ordered pairs.

8. The graph of $f(x)$ is given below.



a. Domain: ______________________

b. Range ______________________

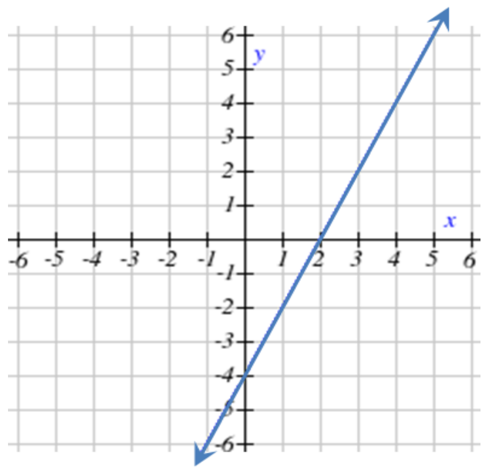
c. $f(-3) =$ __________

d. $f(0) =$ __________

e. $f(x) = 4$ when $x =$__________

f. $f(x) = 0$ when $x =$__________

9. The graph of $g(x)$ is given below.



a. Domain: ______________________

b. Range ______________________

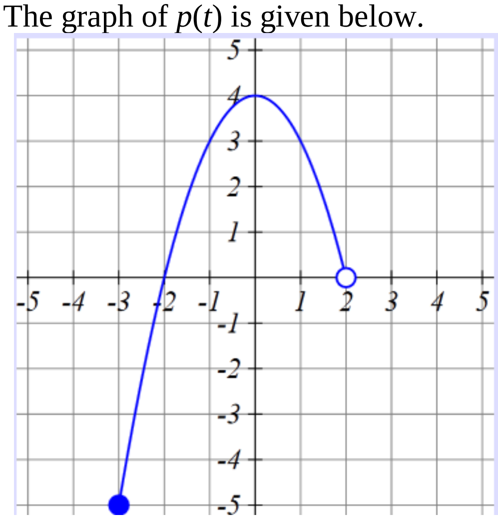
c. $g(3) =$ __________

d. $g(0) =$ __________

e. $g(x) = -2$ when $x =$__________

f. $g(x) = 0$ when $x =$__________

10. The graph of $p(t)$ is given below.



a. Domain: ______________________

b. Range ______________________

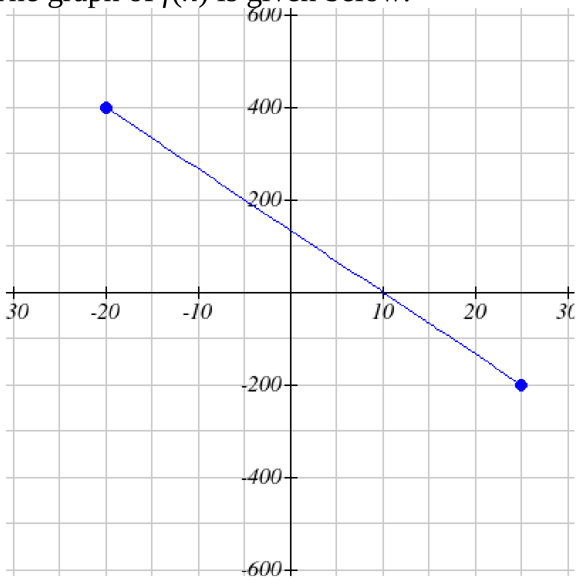
c. $p(-1) =$ __________

d. $p(0) =$ __________

e. $p(t) = -5$ when $t =$__________

f. $p(t) = 3$ when $t =$________________

11. The graph of $f(n)$ is given below.



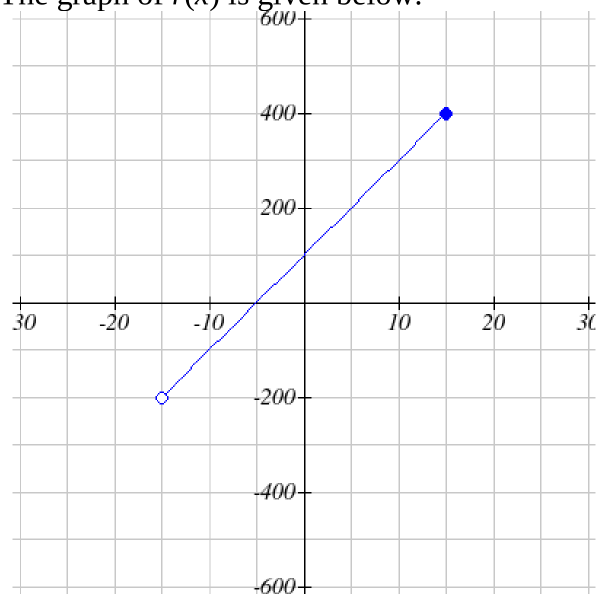
a. Domain: ______________________

b. Range ______________________

c. $f(-5)$ = __________

d. $f(n) = 0$ when n =___________

12. The graph of $r(x)$ is given below.



a. Domain: ______________________

b. Range ______________________

c. $r(-10)$ = __________

d. $r(x) = 300$ when x =___________

Applications

13. A candy company has a machine that produces candy canes. The table below is a partial list of the relationship between the number of minutes the machine is operating and the number of candy canes produced by the machine during that time period.

Minutes t	3	5	8	12	15
Candy Canes $C(t)$	12	20	32	48	60

a. Include units. $C(12)$ = ________________________________

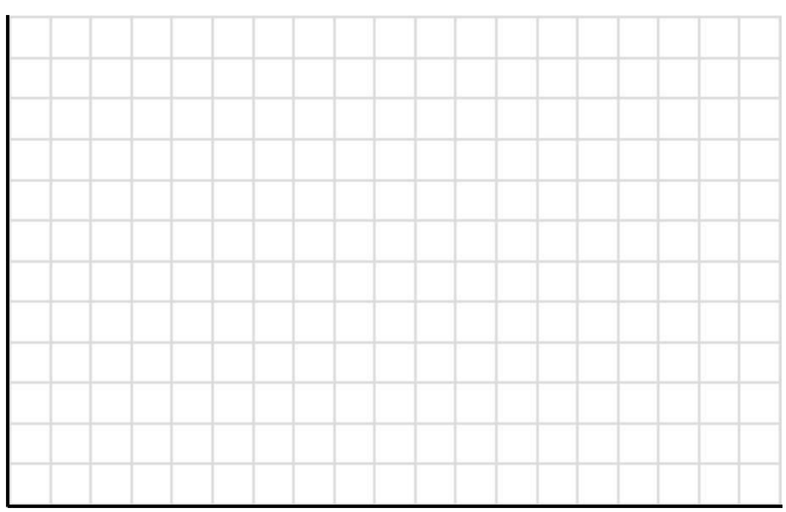
b. In a complete sentence and including all appropriate units, explain the meaning of your answer in part a.

c. Include units. $C(t) = 12$ when t = ________________________________

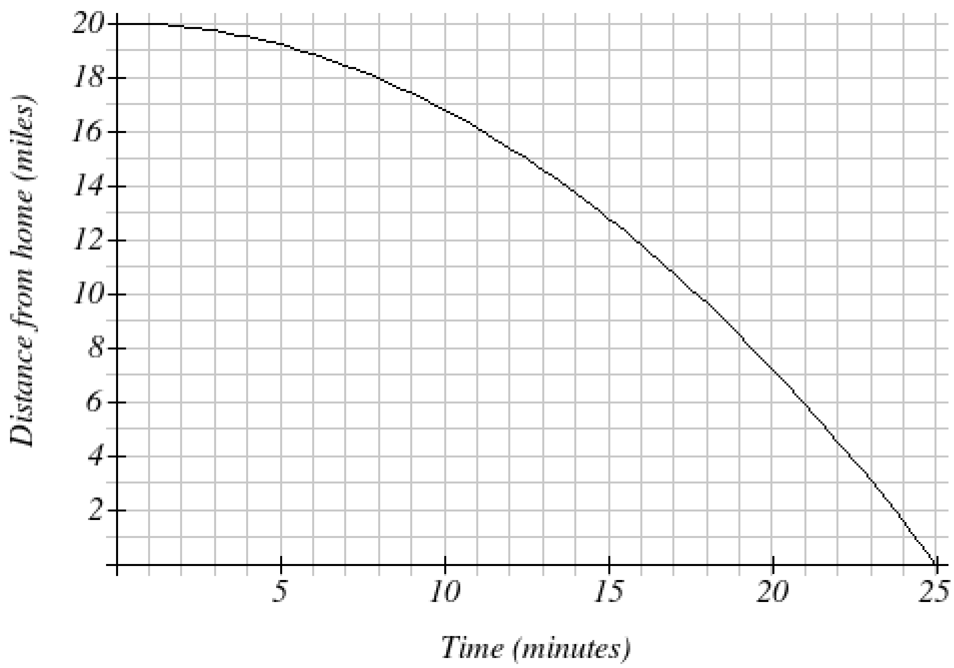
d. In a complete sentence and including all appropriate units, explain the meaning of your answer in part c.

e. This function is (circle one) **increasing** **decreasing**

f. Construct a properly scaled and labeled graph $C(t)$.



14. The function D(t) is shown below.



a. Determine $D(0)$ and interpret its meaning in a complete sentence.

b. Determine $D(8)$ and interpret its meaning in a complete sentence.

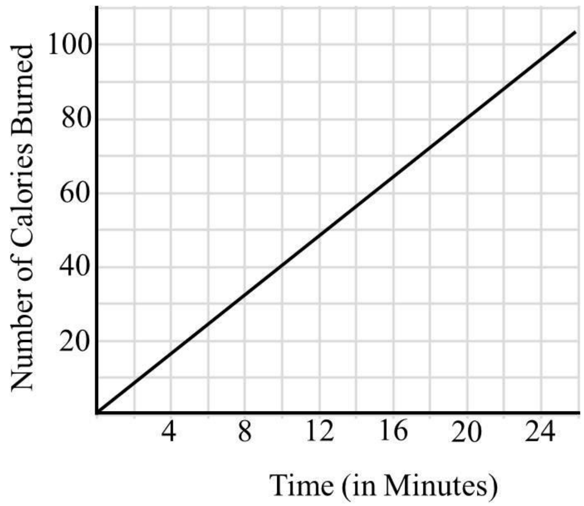
c. For what value of t is $D(t) = 3$? Write a sentence explaining the meaning of your answer.

d. For what value of t is $D(t) = 0$? Write a sentence explaining the meaning of your answer.

e. Determine the practical domain of $D(t)$.

f. Determine the practical range of $D(t)$.

15. The graph of the function $C(n)$ below shows the number of calories burned after riding a stationary bike for n minutes.



a. Is this function increasing or decreasing? ____________________

b. Interpret the meaning of the statement $C(8) = 32$.

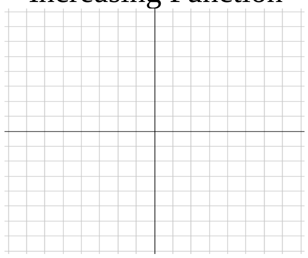
c. Determine $C(10)$ and interpret its meaning in a complete sentence.

d. For what value of n is $C(n) = 80$? Write a sentence explaining the meaning of your answer.

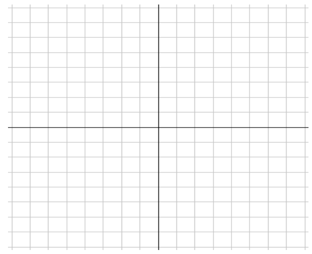
Unit 7: Review

1. In the space below, draw a graph that represents an increasing function, a constant function, and a graph that does NOT represent a function.

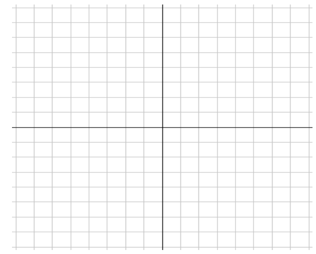
Increasing Function



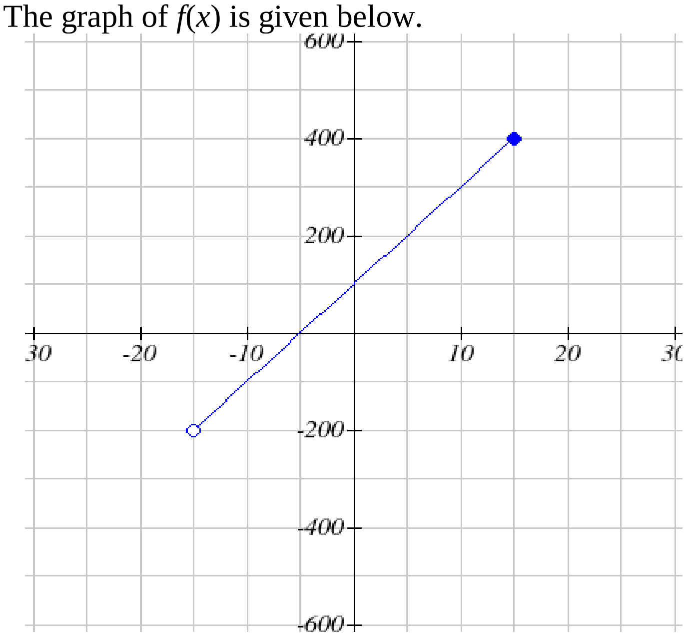
Constant Function



Not a Function



2. The graph of $f(x)$ is given below.



a) Domain: _____ $< x \leq$ _____

b) Range _____ $< f(x) \leq$ _____

c) $f(0) =$ ______

d) $f(x) = 0$ when $x =$_______

3. Consider the following table of values. Fill in the blanks below, and identify the corresponding ordered pairs.

x	–2	–1	0	1	2	3	4
$g(x)$	1	4	8	6	5	0	2

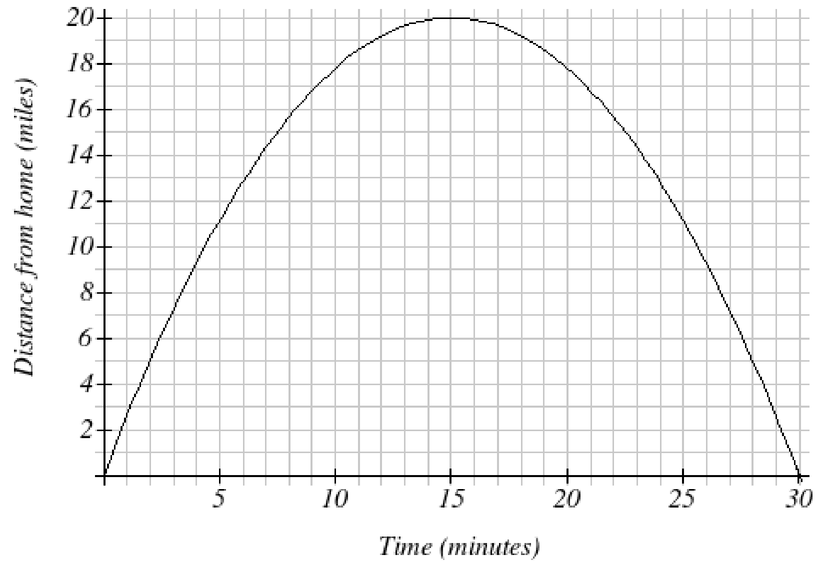
$g(1) =$ _______

Ordered pair: ______________

$g(x) = 1$ when $x =$ ________

Ordered Pair: ______________

4. The function D(t) shown below represents Sally's distance from home over a 30-minute time period.



a. Identify the vertical intercept of D(t). Write it as an ordered pair and explain its meaning in this situation.

b. Identify the horizontal intercepts of D(t). Write them as an ordered pairs and explain their meaning in this situation.

c. Determine $D(15)$ and interpret its meaning in a complete sentence.

d. For what value of t is $D(t) = 5$? Write a sentence explaining the meaning of your answer.

e. Determine the practical domain of $D(t)$. ________________________________

f. Determine the practical range of $D(t)$. ________________________________

Unit 8: Formulas and Functions

Unit 8 Notes

Unit 8: Video Lesson

Section 8.1: Words and Formulas

Example 1: Complete the table below.

Symbolic Rule	Verbal Description
$h(x) = x - 5$	
$k(x) = 5 - x$	
$r(a) = \lvert a \rvert$	
$S(t) = -t$	
	The function $f(x)$ divides the input by 5.
	The function $g(x)$ adds 7 to the input.
	The function $c(t)$ squares the input.

	The function $p(n)$ adds 1 to the input, then doubles the result
	The function $q(w)$ doubles the input, then adds 1

Section 8.1 – You Try

Complete the table below.

Symbolic Rule	Verbal Description
$f(x) = x^2 - 5$	
	The function $p(n)$ multiplies the input by 5 then subtracts that result from 11

Section 8.2: Formulas in Function Notation

Example 1: Let $f(x) = x^2 - 2x + 11$

a. Determine $f(-3)$

b. Determine $f(0)$

Example 2: Let $h(x) = 2x - 5$

a. Determine $h(4)$

b. For what value of x is $h(x) = 17$?

Example 3: Let $g(x) = 71$

a. Determine $g(5)$.

b. Determine $g(–40)$.

Section 8.2 – You Try

Let $r(a) = 4 – 5a$. Write each answer using function notation **and** as an ordered pair.

a. Determine $r(–2)$.

b. For what value of a is $r(a) = 19$?

Section 8.3: Formulas in Function Notation – Applications

Example 1: Grace is selling snow cones at a local carnival. Her profit, in dollars, from selling x snow cones is given by the function $P(x) = 2.5x - 30$.

a. Write a complete sentence to explain the meaning of $P(30) = 45$ in words.

b. Determine $P(10)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: ____________

c. Determine $P(0)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: ____________

d. Determine x when $P(x) = 100$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: ____________

e. Determine x when $P(x) = 0$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: ____________

Section 8.3 – You Try

The function $T(a) = 0.7(220 - a)$, gives the target heart rate, in beats per minute, for a person who is a years of age.

a. Write a complete sentence to explain the meaning of $T(30) = 133$ in words.

b. Determine $T(52)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: ____________

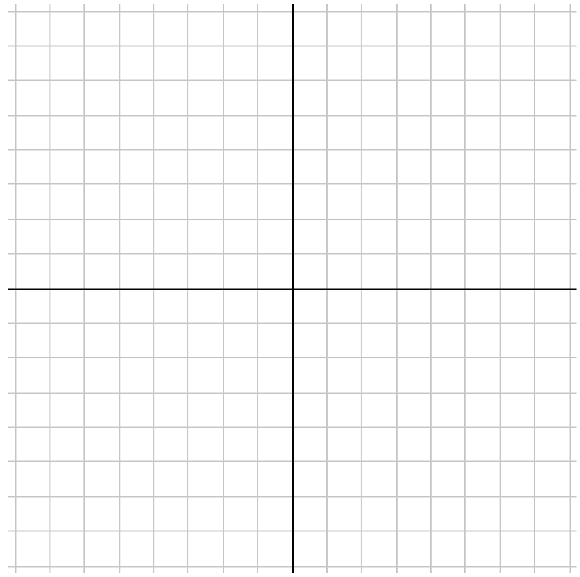
c. Determine a when $T(a) = 140$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

Ordered Pair: ____________

Section 8.4: Graphing Functions

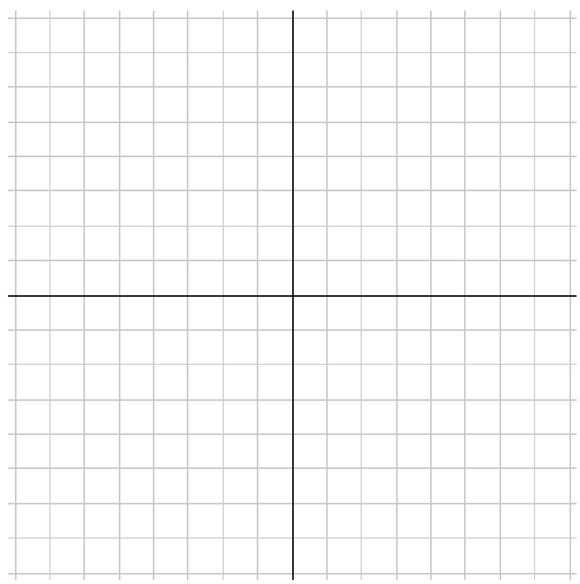
Example 1: Graph the function $S(t) = 4 - 2t$

t	$S(t)$	Ordered Pair



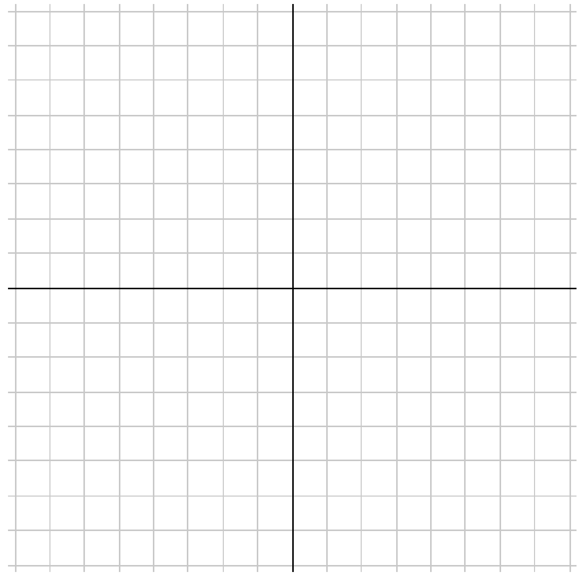
Example 2: Graph the function $f(x) = x^2 - 3$

x	$f(x)$	Ordered Pair



Example 3: Graph the function $p(r) = 5$

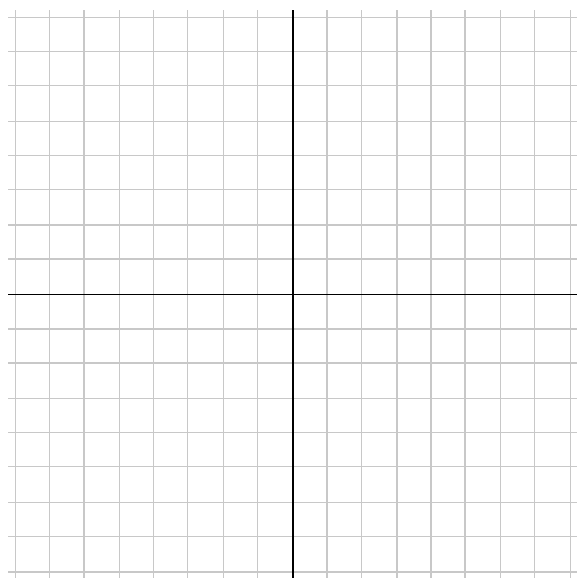
r	$p(r)$	Ordered Pair



Section 8.4 – You Try

Graph the function $f(x) = 5 - x$

x	$f(x)$	Ordered Pair



Section 8.5: Connecting Representations

Example 1: Identify the pattern from the table, and use that information to construct the graph and determine the formula for the function $g(x)$. Then use words to describe the relationship between the input and output variables.

x	$g(x)$	Ordered Pair
-3	-6	
-2	-4	
-1	-2	
0	0	
1	2	
2	4	
3	6	

Symbolic Rule: $g(x)$ = _______________

In words:

Example 2: Use the formula for $H(t)$ to complete the table. Graph the results. Then use words to describe the relationship between the input and output variables.

Symbolic Rule: $H(t) = |t|$

t	$H(t)$	Ordered Pair
–3		
–2		
–1		
0		
1		
2		
3		

In words:

Example 3: Use the description of the function $f(x)$ to complete the table. Graph the results and determine a symbolic rule for the function $f(x)$.

The function f(x) doubles the input value, then adds 5 to the result.

x	$f(x)$	Ordered Pair
-3		
-2		
-1		
0		
1		
2		
3		

Symbolic Rule: $f(x)$= _______________

Section 8.5 – You Try

Identify the pattern from the table, and use that information to construct the graph and determine the formula for the function $g(t)$. Then use words to describe the relationship between the input and output variables.

t	$g(t)$	Ordered Pair
-3	-1	
-2	0	
-1	1	
0	2	
1	3	
2	4	
3	5	

Symbolic Rule: $g(t)$ = _______________

In words:

Section 8.6: Applications

Example 1: A local towing company charges \$3.25 per mile driven plus a nonrefundable base fee of \$30.00. They tow a maximum of 25 miles.

a. Write a formula for the function $C(x)$ which represents total cost as a function of the number of miles driven.

b. Determine C(15). Write your answer as ordered pair then explain its meaning in a complete sentence.

c. Determine the value of x when $C(x) = 82$. Write your answer as ordered pair then explain its meaning in a complete sentence.

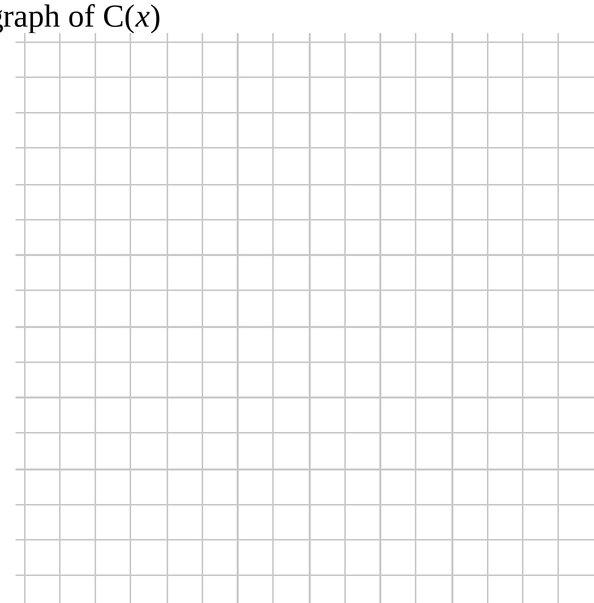
d. Identify the practical domain and practical range of this function by filling in the blanks below. Include units in your answers.

Practical Domain: ______________ $\leq x \leq$ ______________

Practical Range: ______________ $\leq C(x) \leq$ ______________

e. Construct a table of values and draw a good graph of $C(x)$

x	$C(x)$



Section 8.6 – You Try

The value, in dollars, of a washer/dryer set decreases as a function of time t in years. The function $V(t) = -125t + 1500$ models this situation. You own the washer/dryer set for 12 years.

a. Determine V(5). Write your answer as ordered pair then explain its meaning in a complete sentence.

b. Determine the value of t when $V(t) = 500$. Write your answer as ordered pair then explain its meaning in a complete sentence.

c. Identify the practical domain and practical range of this function by filling in the blanks below. Include units in your answers.

Practical Domain: ______________ $\leq t \leq$ ______________

Practical Range: ______________ $\leq V(t) \leq$ ______________

d. Construct a table of values and draw a good graph of V(t)

t	$V(t)$

Unit 8: Practice Problems

Skills Practice

1. Complete the table below.

Symbolic Rule	Verbal Description
$f(x) = x + 8$	
$g(x) = 7 - x$	
$k(a) = 5a$	
$S(r) = 2r - 9$	
	The function $r(x)$ multiplies the input by -8
	The function $m(x)$ subtracts 3 from the input.
	The function $c(v)$ subtracts the input from 6.
	The function $p(t)$ adds 5 to the input, then divides the result by 4
	The function $q(w)$ divides the input by 4, then adds 5

2. Let $W(p) = 4p^2 - 9p + 1$. Show all steps. Write each answer in function notation *and* as an ordered pair.

   a. Determine W(5) .

   b. Determine W(0).

   c. Determine W(–1).

   d. Determine W(–10).

3. Let $k(m) = 8 - 3m$. Show all steps. Write each answer in function notation *and* as an ordered pair.

   a. Determine $k(5)$.

   b. Determine $k(-3)$

   c. For what value of m is $k(m) = 29$?

   d. For what value of m is $k(m) = 0$?

4. Let $R(t) = 1500 + 40t$. Show all steps. Write each answer in function notation *and* as an ordered pair.

   a. Determine $R(18)$.

   b. For what value of t is $R(t) = 3000$?

5. Let $h(x) = 4$. Show all steps. Write each answer in function notation *and* as an ordered pair.

   a. Determine $h(5)$.

   b. Determine $h(81)$.

6. Let $b(w) = \sqrt{w+3}$. Show all steps. Write each answer in function notation *and* as an ordered pair. Round to the nearest hundredth as needed.

   a. Determine $b(1)$.

   b. Determine $b(8)$.

   c. Determine $b(-3)$.

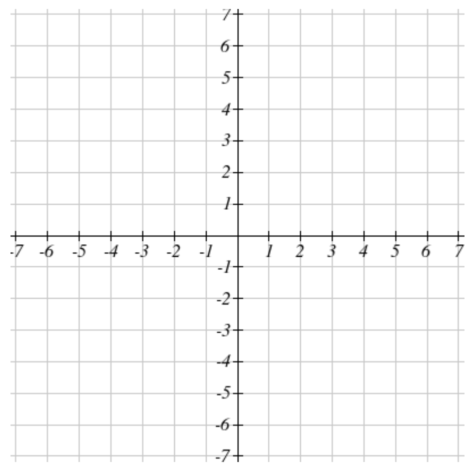
7. Let $p(x) = \frac{45}{2x}$. Show all steps. Write each answer in function notation *and* as an ordered pair.

   a. Determine $p(5)$.

   b. Determine $p(-6)$.

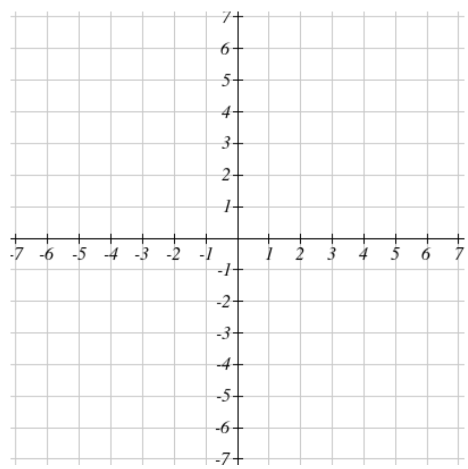
8. Graph the function $S(t) = t + 4$.

t	$S(t)$	Ordered Pair



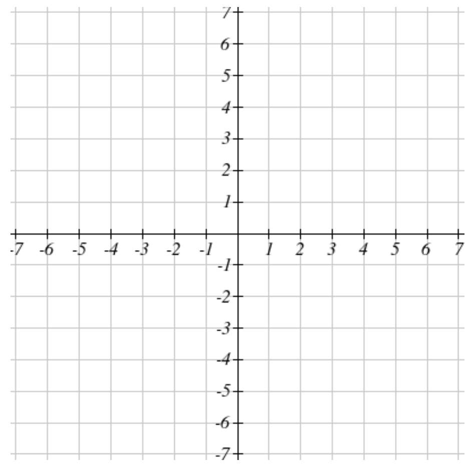
9. Graph the function $f(x) = 4 - 2x$.

x	$f(x)$	Ordered Pair



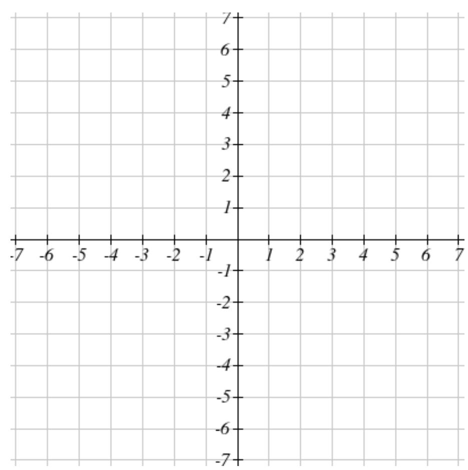
10. Graph the function $p(r) = 3$

r	$p(r)$	Ordered Pair



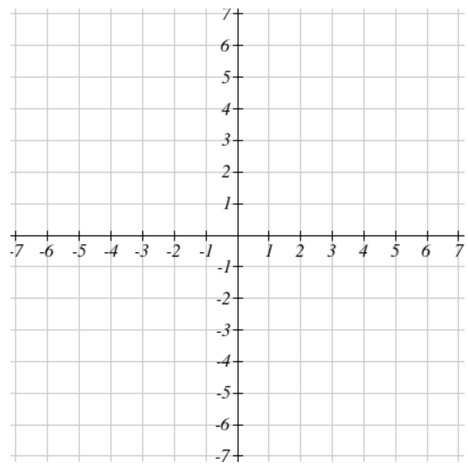
11. Graph the function $f(x) = x$

x	$f(x)$	Ordered Pair



12. Identify the pattern from the table and use that information to construct the graph and determine the formula for the function $g(x)$. Then use words to describe the relationship between the input and output variables.

x	$g(x)$	Ordered Pair
-3	3	
-2	2	
-1	1	
0	0	
1	-1	
2	-2	
3	-3	



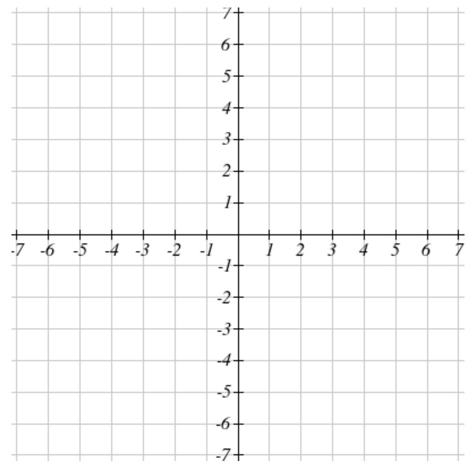
Symbolic Rule: $g(x) =$ _______________

In words:

13. Use the description of the function $f(x)$ to complete the table. Graph the results and determine a symbolic rule for the function $f(x)$. Then use words to describe the relationship between the input and output variables.

The function f(x) subtracts 3 from the input.

x	$f(x)$	Ordered Pair
-3		
-2		
-1		
0		
1		
2		
3		



Symbolic Rule: $f(x) =$ _______________

Applications

14. A rock is dropped from the top of a building. The height (measured in feet) of the rock above the ground is given by the function $h(t) = 100 - 16t^2$ where t represents time measured in seconds.

a. Complete the table below.

t	0	0.5	1	1.5	2	2.5
$h(t)$						

b. Is this function increasing or decreasing? ___________________________

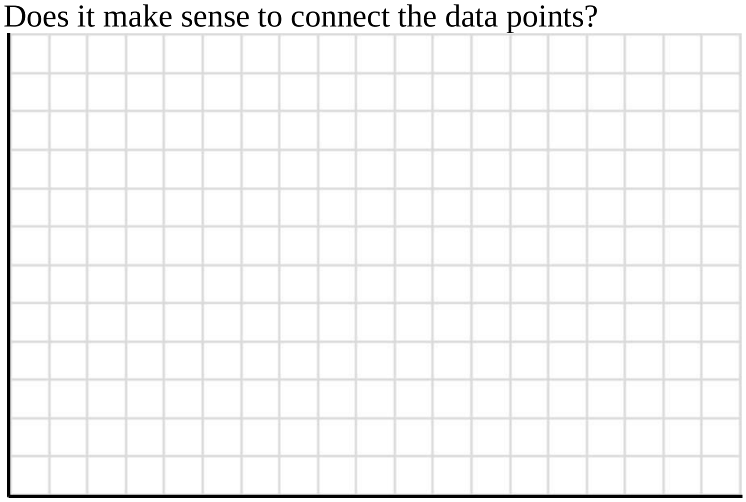
c. Determine $h(1)$. Write a sentence explaining the meaning of your answer.

d. For what value of t is $h(t) = 0$? Explain the meaning of your answer.

e. Determine the practical domain ____

f. Determine the practical range ____

g. Construct a good graph of $h(t)$. Does it make sense to connect the data points?



15. John is a door to door vacuum salesman. His weekly salary is given by the linear function $S(v) = 200 + 50v$, where v is the number of vacuums sold.

    a. Determine $S(12)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

    Ordered Pair: ____________

    b. Determine $S(0)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

    Ordered Pair: ____________

    c. Determine v when $S(v) = 500$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

    Ordered Pair: ____________

16. The function $P(n) = 455n - 1820$ represents a computer manufacturer's profit when n computers are sold.

   a. Write a complete sentence to explain the meaning of $P(5) = 455$ in words.

   b. Determine $P(10)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

   Ordered Pair: ____________

   c. Determine $P(0)$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

   Ordered Pair: ____________

   d. Determine x when $P(n) = 0$. Show your work. Write your answer as an ordered pair and interpret the meaning of this ordered pair in a complete sentence.

   Ordered Pair: ____________

17. The function $V(n)= 221.4 + 4.25n$ gives the value, in thousands of dollars, of an investment after n years. Determine $V(20)$, and write a sentence explaining the meaning of your answer.

18. The function $E(t) = 3861 – 77.2t$ gives the surface elevation (in feet above sea level) of Lake Powell t years after 1999.

    a. Determine E(0), and write a sentence explaining the meaning of your answer.

    b. Determine E(4), and write a sentence explaining the meaning of your answer.

    c. This function accurately models the surface elevation of Lake Powell from 1999 to 2005. Determine the practical range of this linear function.

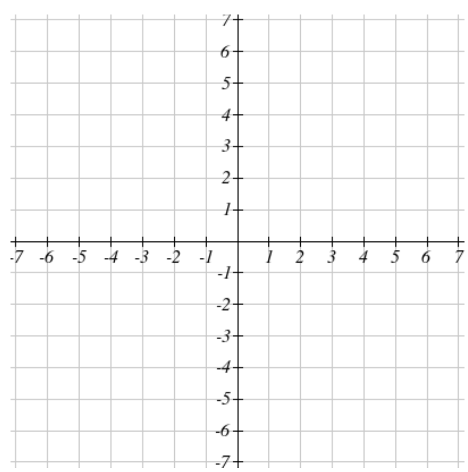
Unit 8: Review

1. Complete the table below.

Symbolic Rule	Verbal Description
$f(x) = 3x + 5$	
	The function $g(x)$ squares the input, then multiplies that result by 2

2. Graph the function $p(r) = 3 - r$

r	$p(r)$	Ordered Pair



3. A local towing company charges \$5.50 for each mile plus a reservation fee of \$12. They tow a maximum of 30 miles.

   a. Write a formula for the function C(x), representing the total cost to tow the car x miles.

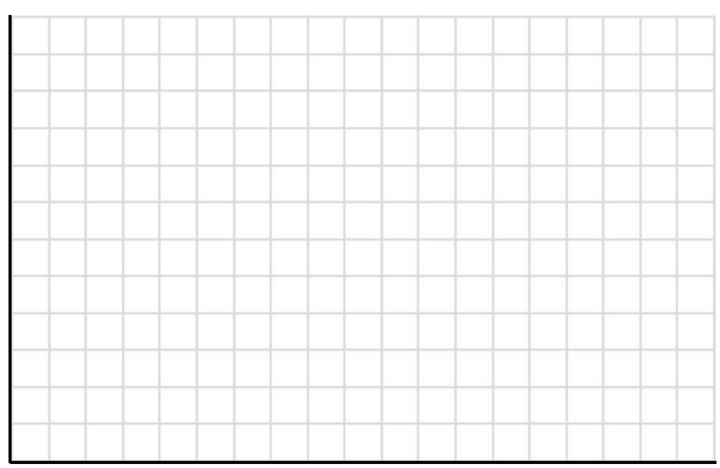
   b. Determine C(8). Show your work. Write your answer as an ordered pair and interpret its meaning in a complete sentence.

   c. Determine x when C(x) = 100. Show your work. Write your answer as an ordered pair and interpret its meaning in a complete sentence.

   d. Practical domain (include units): __________________ $\leq x \leq$ ____________________

   e. Practical range (include units): ___________________ $\leq$ C(x) $\leq$ __________________

   f. Construct a good graph of $C(x)$.



Unit 9: Introduction to Linear Functions

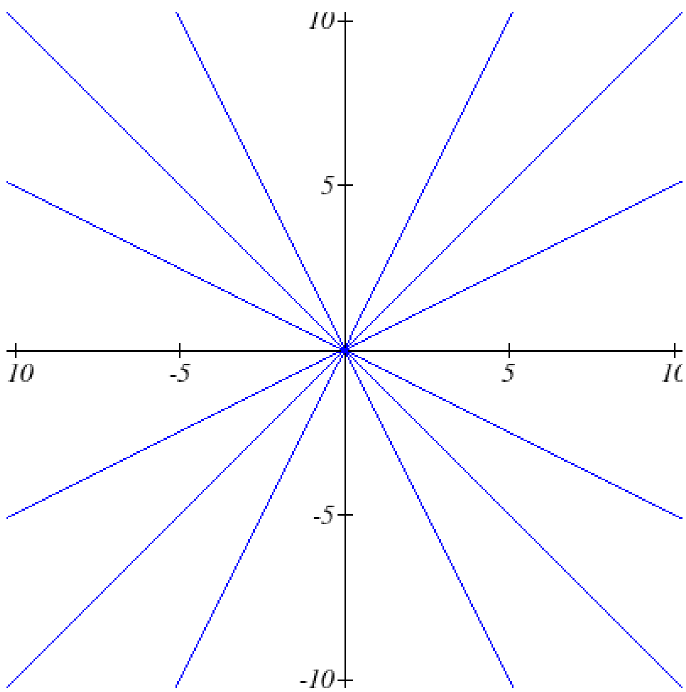
Unit 9 Notes

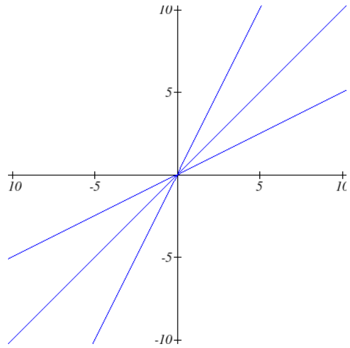
Unit 9: Video Lesson

Section 9.1: Linear Functions

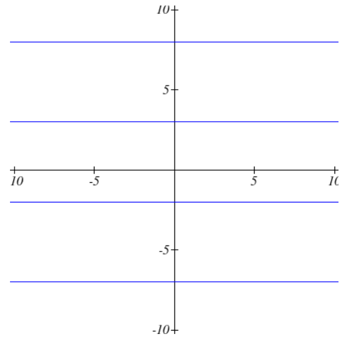
A linear function is a function that fits the form:

A linear function can be graphically represented by a ______________________________

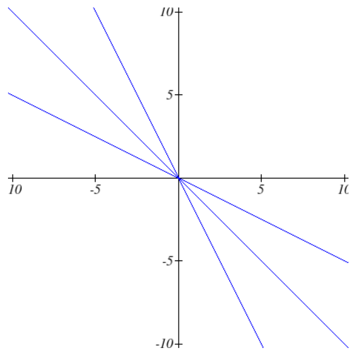




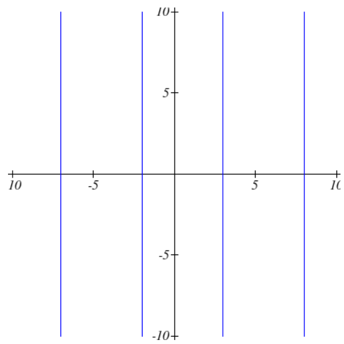
Increasing Linear Function
Slope > 0



Constant Function
Slope = 0

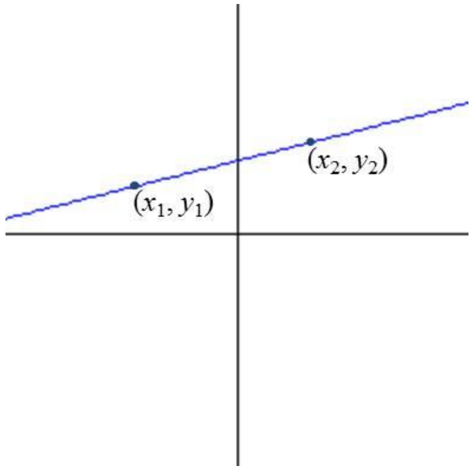


Decreasing Linear Function
Slope < 0



Not a Function
Slope is Undefined (No Slope)

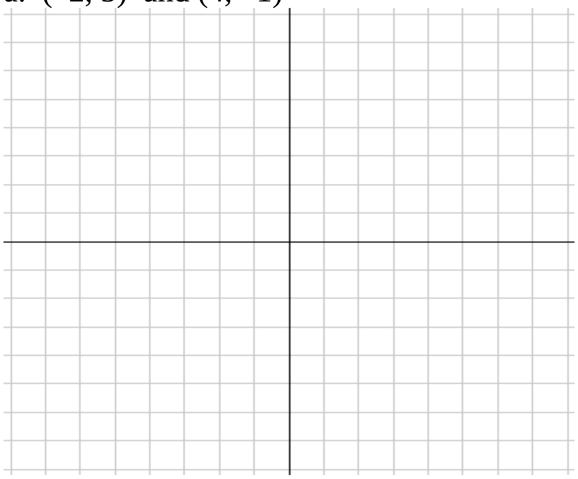
$$m = \text{Slope} = \frac{\text{Change in OUTPUT}}{\text{Change in INPUT}} = \frac{\Delta\,\text{OUTPUT}}{\Delta\,\text{INPUT}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$



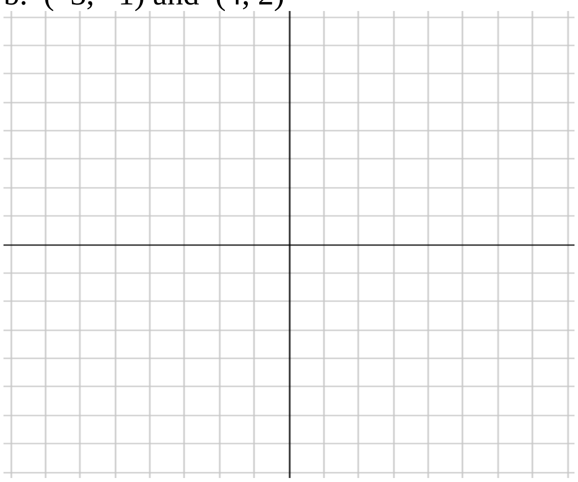
$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

Example 1: Determine the slope for each of the following:

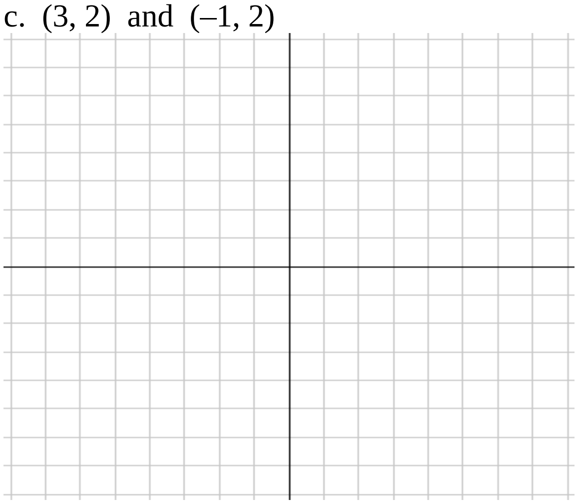
a. (–2, 3) and (4, –1)



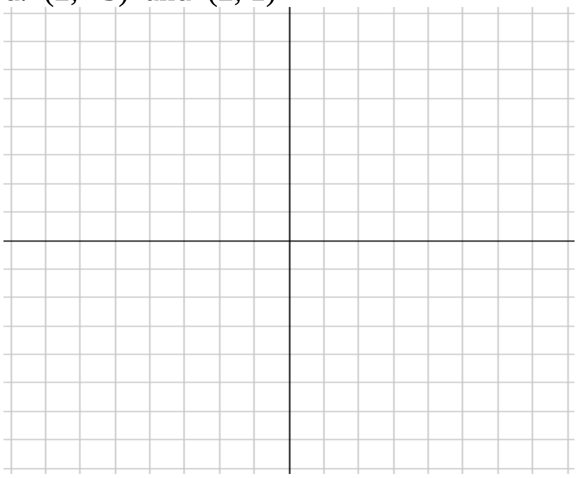
b. (–3, –1) and (4, 2)



c. (3, 2) and (–1, 2)

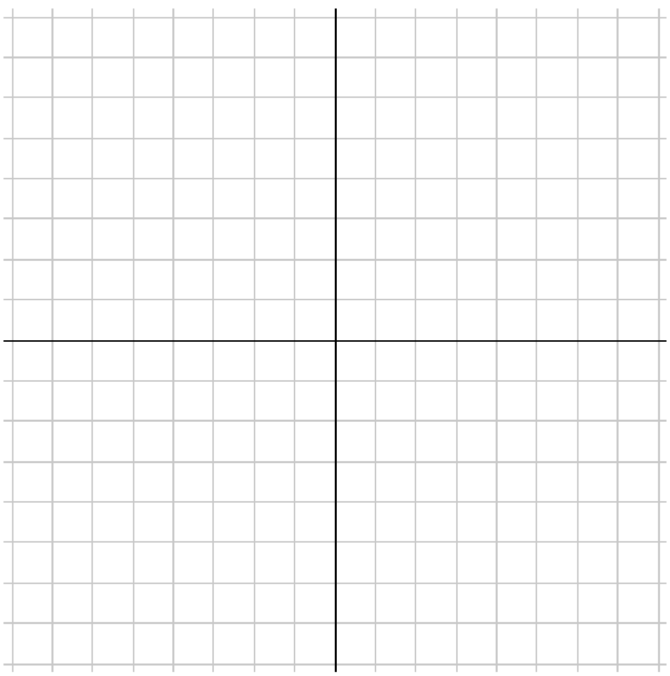


d. (2, –3) and (2, 1)



Section 9.1 – You Try

Plot the points and determine the slope of the line between them. (–4, –1) and (5, –6)



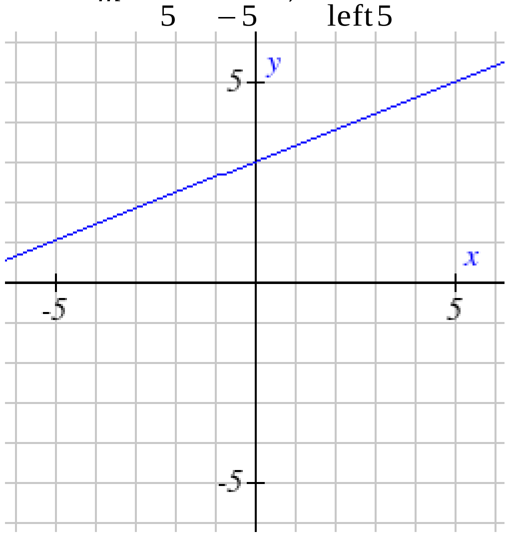
Section 9.2: Graphing Linear Functions

USING THE SLOPE TO GRAPH A LINEAR FUNCTION

$$m = \text{Slope} = \frac{\text{Change in OUTPUT}}{\text{Change in INPUT}} = \frac{\text{Vertical Change}}{\text{Horizontal Change}} \rightarrow \frac{\updownarrow}{\leftrightarrow}$$

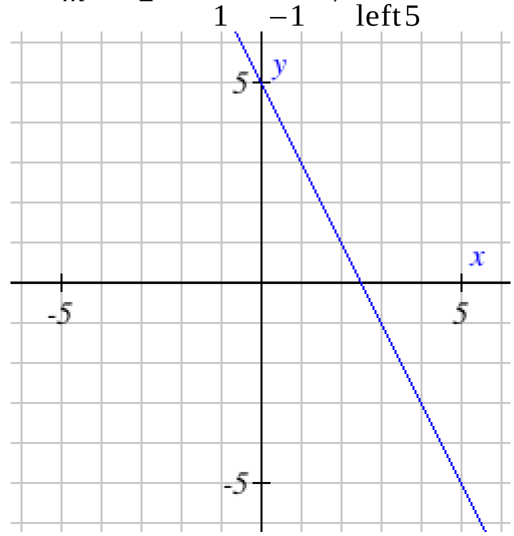
$$m = \frac{2}{5} \rightarrow \frac{\text{up } 2}{\text{right } 5}$$

$$m = \frac{2}{5} = \frac{-2}{-5} \rightarrow \frac{\text{down } 2}{\text{left } 5}$$



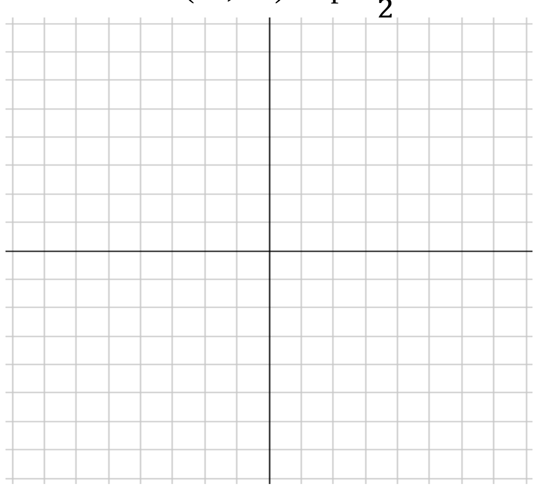
$$m = -2 = -\frac{2}{1} = \frac{-2}{1} \rightarrow \frac{\text{down } 2}{\text{right } 1}$$

$$m = -2 = -\frac{2}{1} = \frac{2}{-1} \rightarrow \frac{\text{up } 2}{\text{left } 5}$$

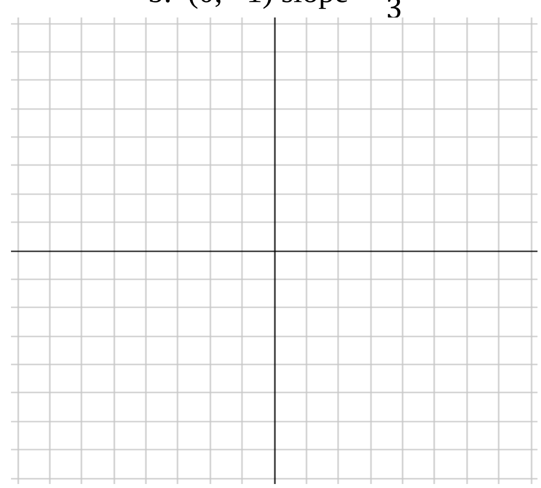


Example 1: Draw an accurate graph for each of the following

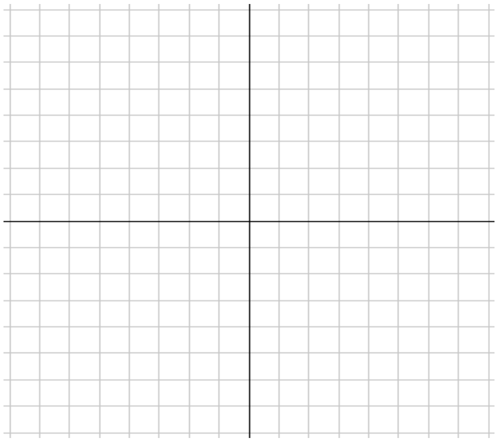
a. (–2, –3) slope $\frac{1}{2}$



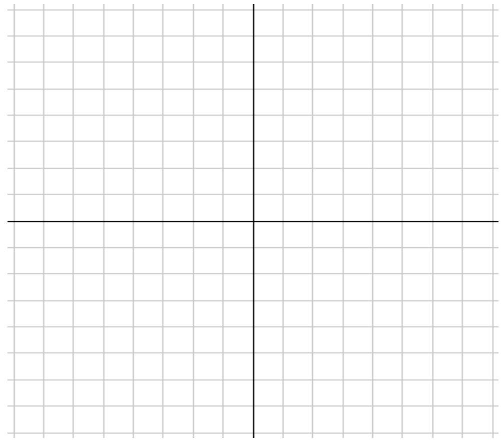
b. (0, –1) slope $-\frac{2}{3}$



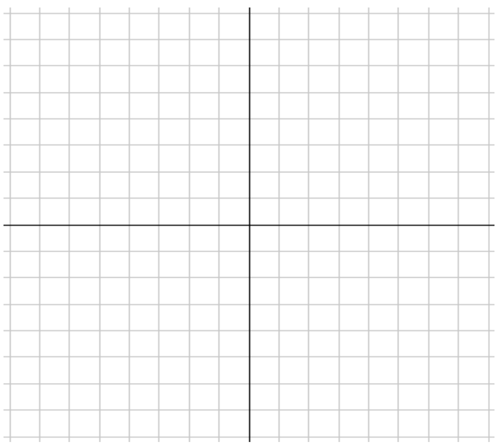
c. (2, 1) slope 3



d. (1, –4) slope 0

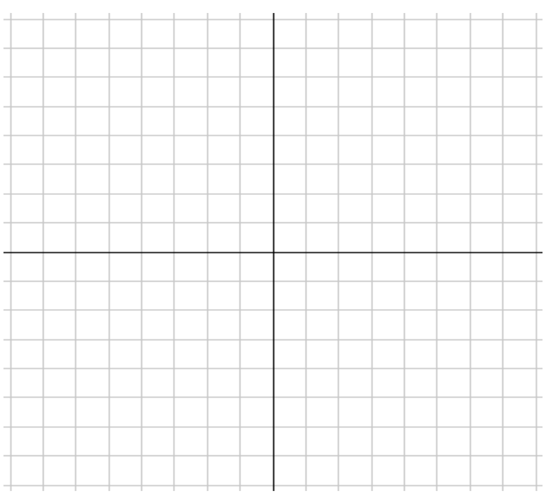


e. (5, 2) undefined slope



Section 9.2 – You Try

Sketch the graph of a linear function that passes through the point (1, –2) with slope = $-\frac{3}{5}$.



Your line must extend accurately from edge to edge of the graph shown

Give the **coordinates** of at least two additional points on the line.

____

Section 9.3: Interpreting the Slope of a Linear Function

$$\text{Slope} = \frac{\text{Change in Output}}{\text{Change in Input}} \qquad \text{Units of Slope} = \frac{\text{Output Units}}{\text{Input Unit}} \rightarrow \text{Rate of Change}$$

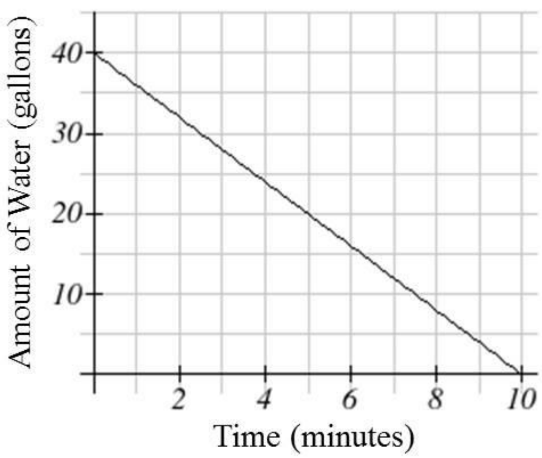
Example: Output = Height in Feet Input = Time in Seconds

$$\text{Slope} = \frac{\text{Change in Height}}{\text{Change in Time}} \qquad \text{Units of Slope} = \frac{\text{feet}}{\text{second}} = \text{feet/second}$$

What is the meaning of a slope of –5?

What is the meaning of a slope of 8?

Example 1: Consider the graph shown below.



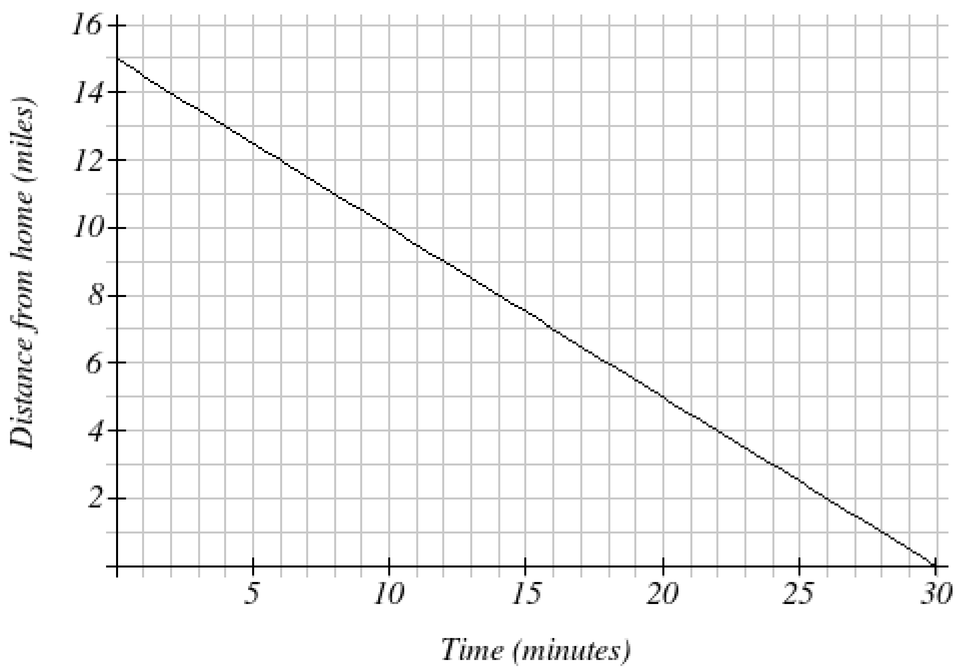
a. Identify the vertical intercept and interpret its meaning.

b. Identify the horizontal intercept and interpret its meaning.

c. Determine the slope, and interpret its meaning.

Section 9.3 – You Try

The graph below shows Sally's distance from home over a 30 minute time period.



a. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning.

b. Identify the horizontal intercept. Write it as an ordered pair and interpret its meaning.

c. Determine the slope, and interpret its meaning.

Section 9.4: Using Rates of Change to Build Tables and Graphs

For each of the examples below, *circle* the rate of change in each situation and *underline* the starting value. Then use the given information to complete the table. Graph the results, and decide if it would make sense to connect the data points on the graph.

Example 1: A local carpet cleaning company charges $15 for each room plus a nonrefundable reservation fee of $25.

Number of Rooms	*Total Cost (dollars)*
0	
1	
2	
3	
4	
5	
6	

Example 2: Water is leaking out of a tank at a constant rate of 2 gallons per minute. The tank initially held 12 gallons of water.

Time (minutes)	*Amount of Water in Tank (gallons)*
0	
1	
2	
3	
4	
5	
6	

Section 9.4 – You Try

Sara is selling snow cones at the local carnival for $3 each.

Identify the rate of change in this situation. Be sure to include units in your answer.

Complete the table to show Sara's revenue from selling the snow cones. Graph the results, and decide if it would make sense to connect the data points on the graph.

Number of Snow Cones	Revenue (in dollars)
0	
1	
2	
3	
4	
5	
6	

Section 9.5: Is the Function Linear?

Rate of Change of a Linear Function
Given any two points (x_1, y_1) and (x_2, y_2), the **rate of change** between the points on the interval x_1 to x_2 is determined by computing the following ratio: $$\text{Rate of Change} = \frac{\text{Change in Output}}{\text{Change in Input}} = \frac{y_2 - y_1}{x_2 - x_1}$$ If the function is LINEAR, then the rate of change will be *the same* between any pair of points. This constant rate of change is the SLOPE of the linear function.

Example 1: Determine if the following function is linear by computing the rate of change between several pairs of points. If it is linear, give the slope.

x	y
-5	23
-2	14
0	8
3	-1
8	-16

Example 2: Determine if the following function is linear by computing the rate of change between several pairs of points. If it is linear, give the slope.

n	$T(n)$
-6	-3
-2	-1
0	1
1	2
4	6

Example 3: Determine if the following function is linear by computing the rate of change between several pairs of points. If it is linear, give the slope.

x	$g(x)$
-5	3
-2	3
0	3
4	3
6	3

Section 9.5 – You Try

Determine if the following function is linear by computing the rate of change between several pairs of points. If it is linear, give the slope.

x	y
-8	-30
-3	-10
0	2
2	10
5	22

Unit 9: Practice Problems

Skills Practice

1. Determine the slope of the line between each of the following pairs of points. Show all steps, and reduce your answer to lowest terms.

a. (4, –5) and (–2, 3)

b. (–3, 2) and (1, 8)

c. (5, –9) and (5, 2)

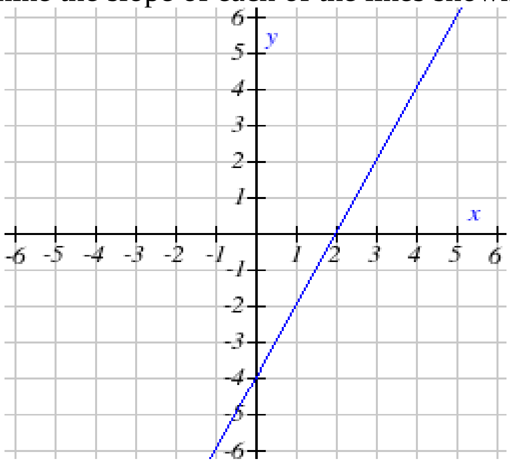
d. (2, –1) and (–2, 3)

e. (4, 3) and (12, –3)

f. (2, –4) and (7, –4)

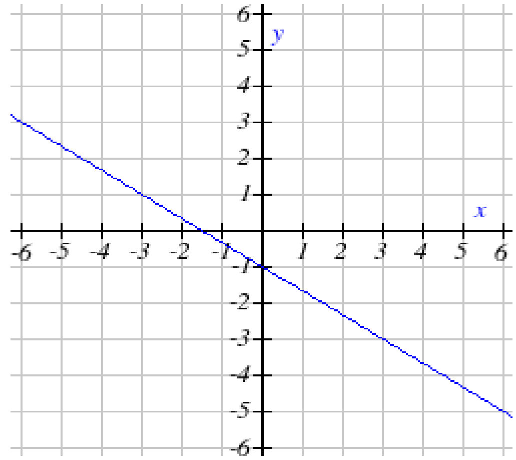
2. Determine the slope of each of the lines shown below.

a.



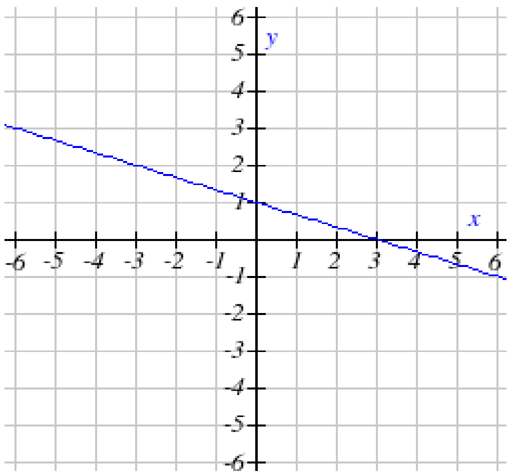
Slope = ____________

b.



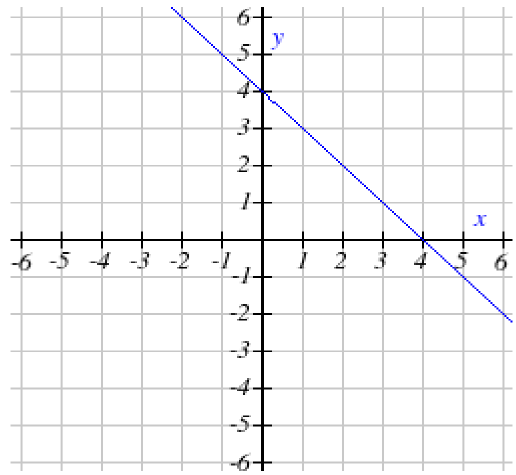
Slope = ____________

c.



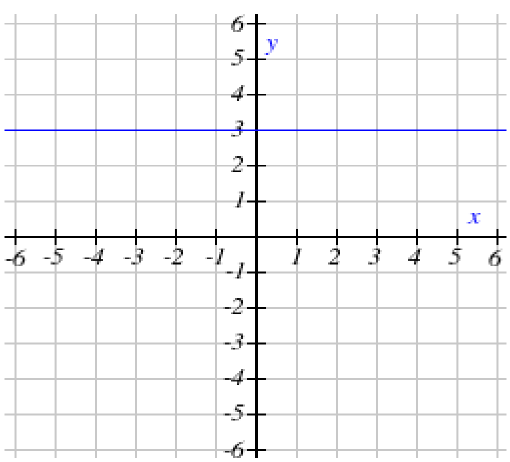
Slope = ____________

d.



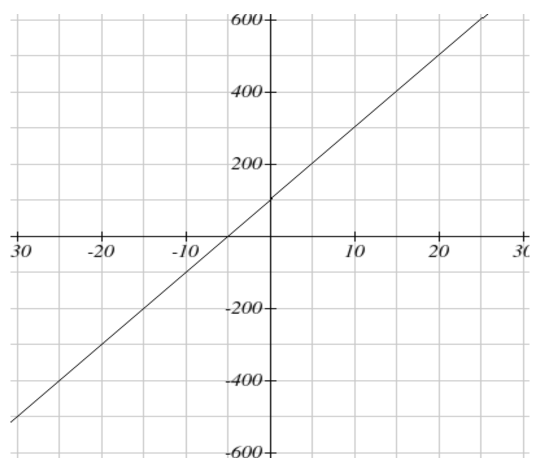
Slope = ____________

e.



Slope = ____________

f.

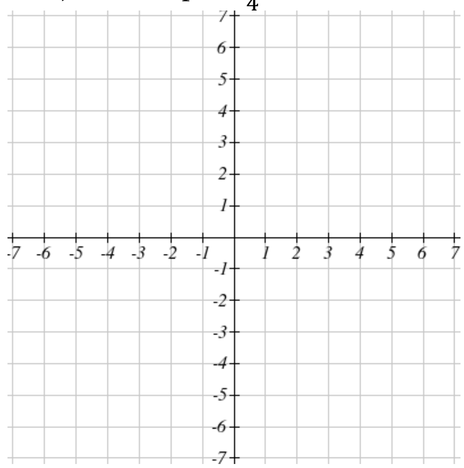


Slope = ____________

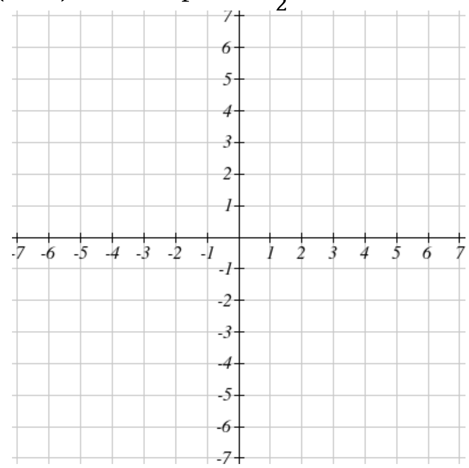
3. Draw an **accurate** graph for each of the following by

- Plotting the point
- Using the slope to find at least two additional points

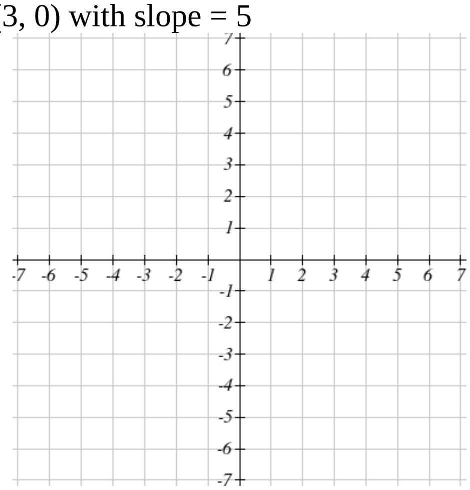
a. (1, –2) with slope = $\frac{1}{4}$



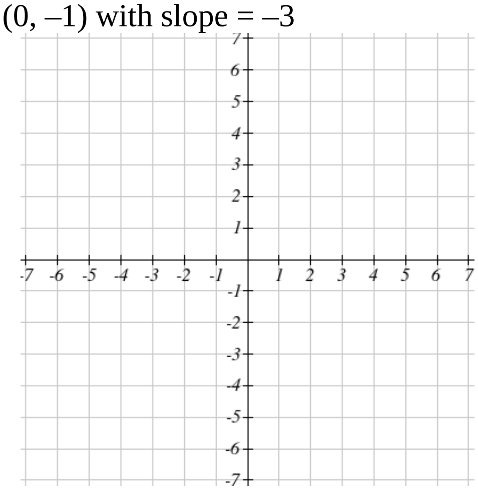
b. (–1,3) with slope = $-\frac{3}{2}$



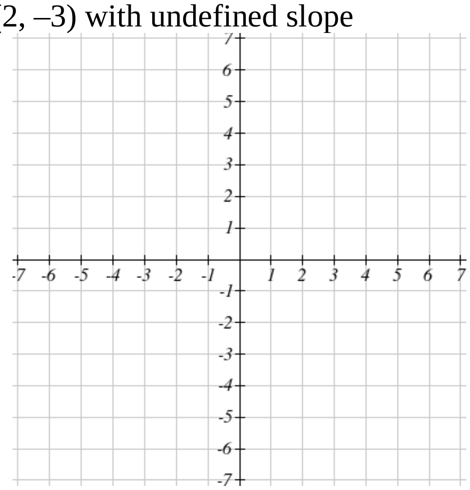
c. (3, 0) with slope = 5



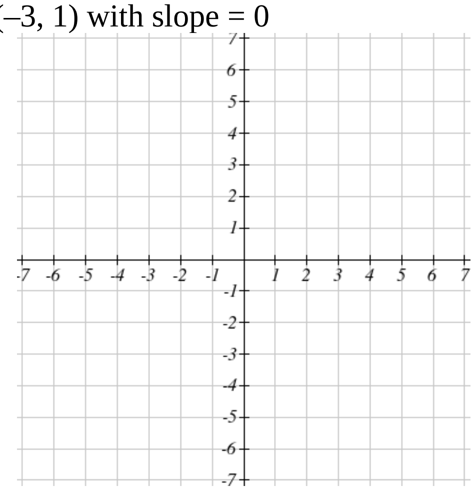
d. (0, –1) with slope = –3



e. (2, –3) with undefined slope



f. (–3, 1) with slope = 0



4. For each of the following, determine if the function is linear by computing the rate of change between several pairs of points. If it is linear, give the slope.

a.

x	y
-3	2
-1	8
0	16
2	64
3	128

b.

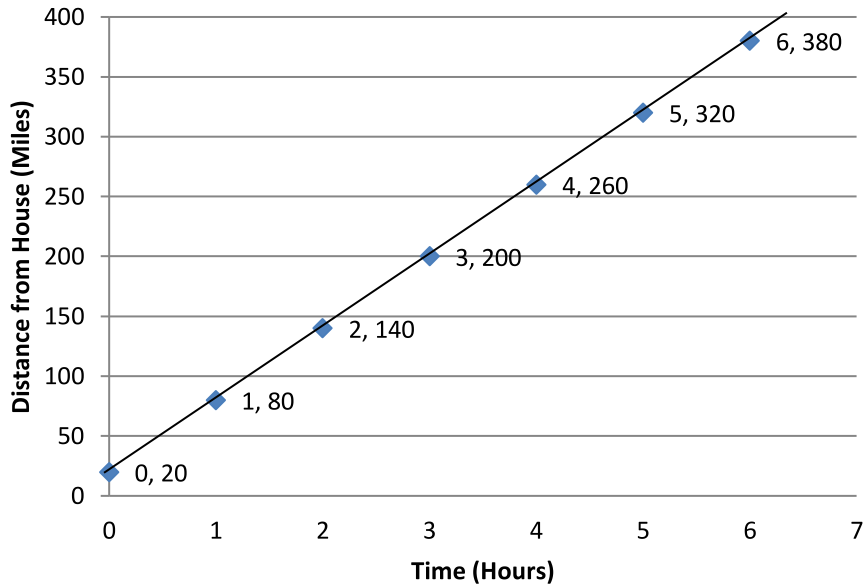
n	$A(n)$
-4	28
-1	19
5	1
11	-17
14	-26

c.

t	$r(t)$
-6	5
-3	6
4	7
11	8
18	9

Applications

5. The graph below shows the distance you are from your house if you leave work and drive in the opposite direction.



a. In a complete sentence, interpret the ordered pair (2, 140)

b. Identify the vertical intercept and interpret its meaning.

c. Determine the slope, and interpret its meaning.

d. At this rate, how far away from home will you be after 7 hours?

e. Challenge Problem: At this rate, how long will it take for you to be 680 miles from your home?

6. You need to hire a caterer for a banquet.

a. Caterer A charges a nonrefundable delivery fee of $45 plus $5 per guest.
b. Caterer B charges a fee of $150. This includes the delivery and food for up to 30 guests.

Use this information to complete the tables below. Draw good graphs of your results.

Number of Guests	*Cost (dollars) Caterer A*
0	
1	
2	
3	
4	
5	
6	

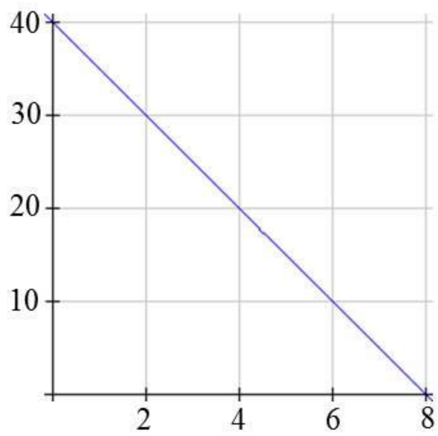
Number of Guests	*Cost (dollars) Caterer B*
0	
1	
2	
3	
4	
5	
6	

Which caterer should you choose? What considerations should be made before making this decision?

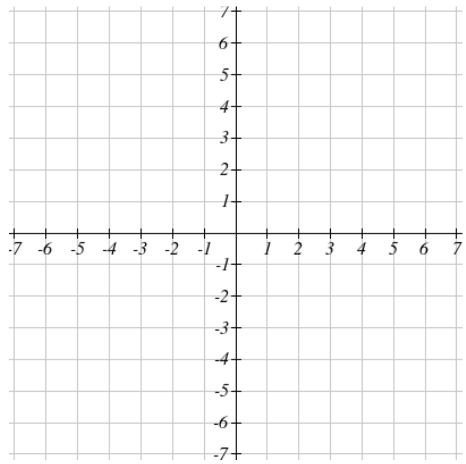
Unit 9: Review

1. Determine the slope of the line between the points (2, –1) and (–2, 3). Show all steps, and reduce your answer to lowest terms.

2. Determine the slope of the line shown below.



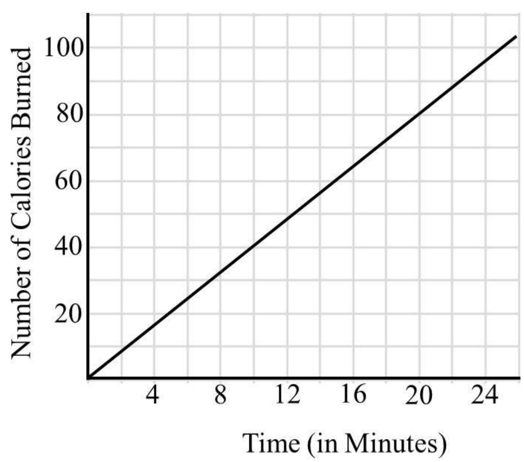
3. Draw an **accurate** graph of the line passing through the point (–2,4) with slope $-\frac{2}{5}$.



4. Determine if the function $g(x)$ is linear by computing the rate of change between several pairs of points. If it is linear, give the slope.

x	$g(x)$
-8	39
-2	18
0	11
4	-3
12	-31

5. The graph of the function $C(n)$ below shows the number of calories burned after riding a stationary bike for n minutes.



a. Interpret the meaning of the ordered pair (20,80).

b. Interpret the meaning of the statement $C(8) = 32$

c. Determine $C(10)$ and interpret its meaning in a complete sentence.

d. Determine the slope of $C(n)$ and interpret its meaning in a complete sentence.

Unit 10: The Equation of a Linear Function

Unit 10 Notes

Unit 10: Video Lesson

Section 10.1: The Equation of a Linear Function

Slope – Intercept Form

SLOPE-INTERCEPT FORM:

$y = mx + b$

$y = b + mx$

$f(x) = mx + b$

Slope	Behavior
$m > 0$	Increasing
$m < 0$	Decreasing
$m = 0$	Horizontal
m is undefined	Vertical

Example 1: Fill in the table below.

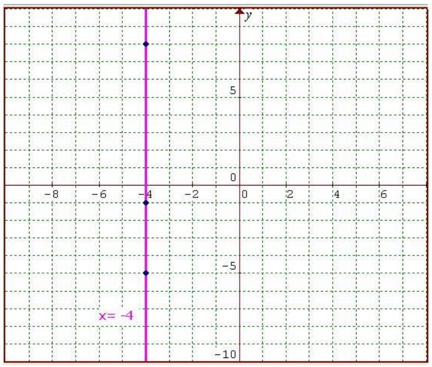
Equation	Slope	I, D, H, V	Vertical Intercept
$y = 3x + 5$			
$y = 8 - x$			
$y = 2x$			
$y = -8$			

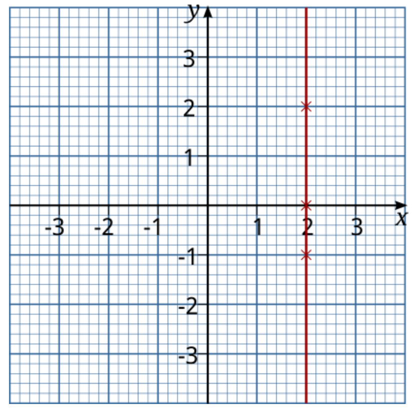
Example 2: Determine the *horizontal* intercepts of each of the following.

$y = 3x + 5$ $y = 8 - x$ $y = 2x$ $y = -8$

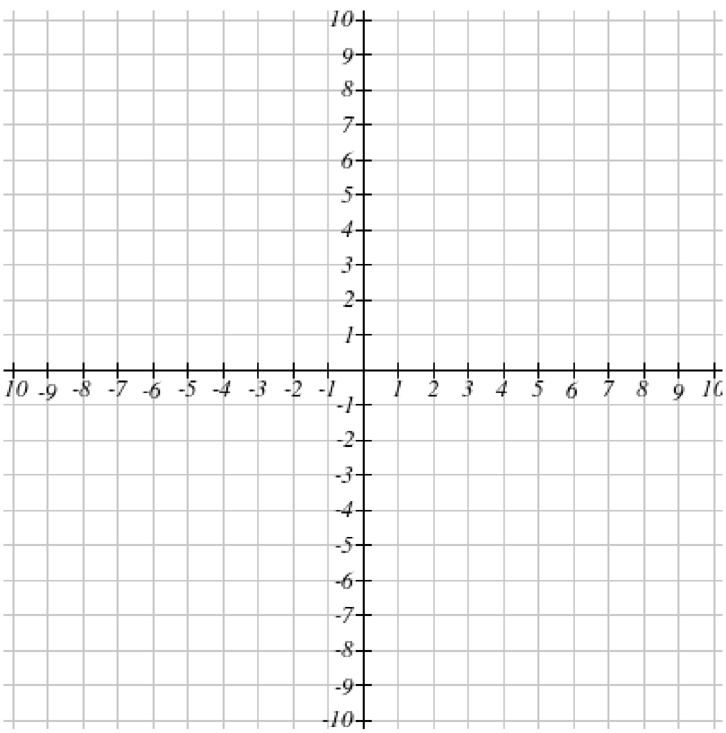
To find a horizontal intercept: ______________________________

Example 3:   The equation of a vertical line





Example 4:   Draw an **accurate** graph of the function $f(x) = 4 - 3x$.



Slope: ___________

Vertical Intercept:

____

Horizontal Intercept:

____

Two additional points on the line:

____

____

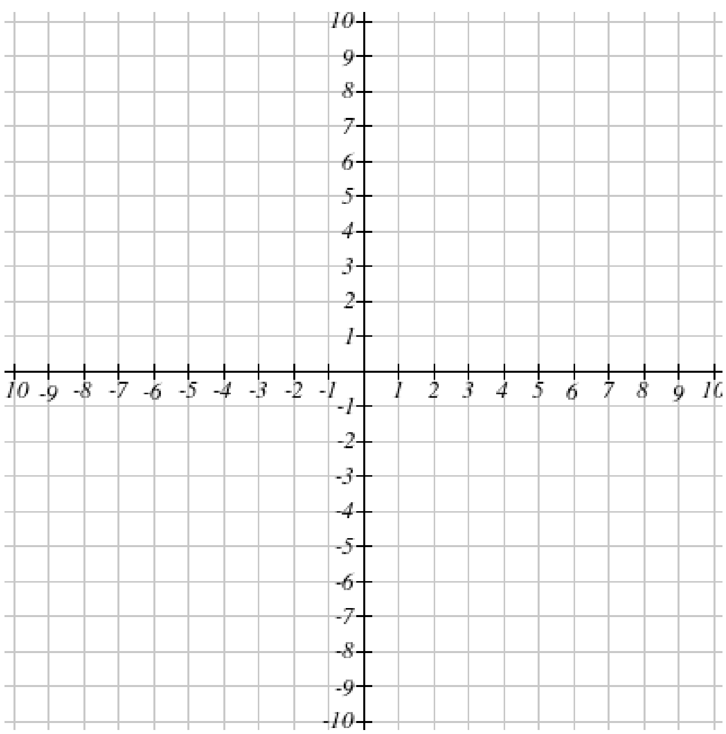
Section 10.1 – You Try

Complete the problems below.

a. Fill in the table below. Write intercepts as ordered pairs.
I = Increasing, D = Decreasing, H = Horizontal (Constant), V = Vertical

Equation	Slope	I, D, H, V	Vertical Intercept
$y = x - 11$			
$G(x) = -2x$			
$x = 5$			

b. Draw an **accurate** graph of the function $y = \frac{3}{4}x - 5$.



Slope: ____________

Vertical Intercept:
____

Horizontal Intercept:
____

Two additional points on the line:

____
____

Section 10.2: Writing the Equation of a Line in Slope-Intercept Form

Slope-Intercept Form $y = mx + b$

Example 1: Give the equation of the line in slope-intercept form

a. With vertical intercept (0, 2) and slope –9

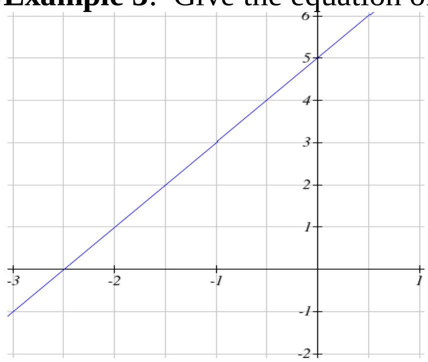
b. Passing through (2, 3) with slope –5

c. Passing through (2, 6) and (4, 16)

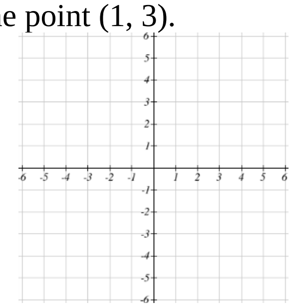
Example 2: Give the equation of the linear function that would generate the following table of values. Use your calculator to check.

x	$f(x)$
–5	238
–3	174
–1	110
1	46
7	–146
12	–306

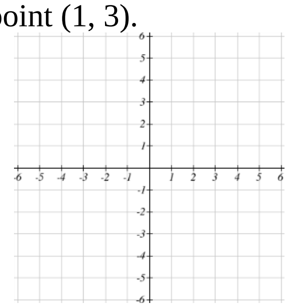
Example 3: Give the equation of the linear function shown below.



Example 4: Give the equation of the horizontal line passing through the point (1, 3).



Example 5: Give the equation of the vertical line passing through the point (1, 3).



Section 10.2 – You Try

Complete the problems below. Show as much work as possible, as demonstrated in the Media Examples.

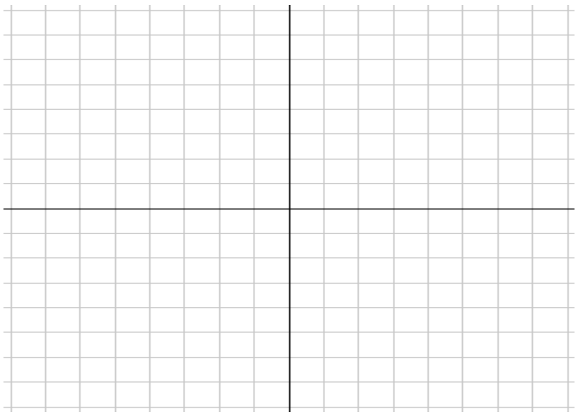
a. Give the equation of the line passing through the points (1, 7) and (3, –9).

b. Give the equation of the horizontal line passing through the point (5, 11).

Section 10.3: Parallel and Perpendicular Lines

Parallel Lines

The slopes of Parallel Lines are ____



Slope-Intercept Form

$y = mx + b$ $f(x) = mx + b$

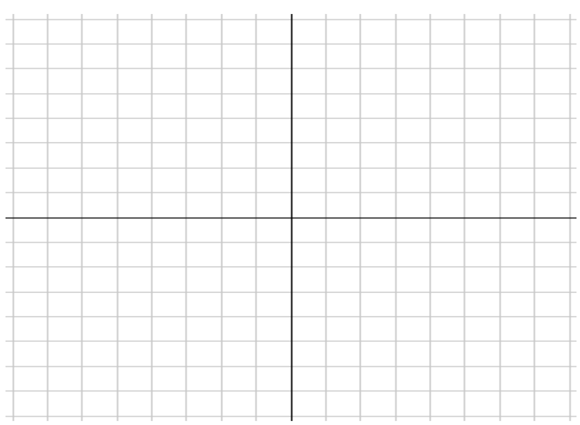
m = slope

b = vertical intercept $(0,b)$

Example 1: Give the equation of the line passing through the point (8, 3) that is **parallel** to the line $y = –2x + 3$.

Perpendicular Lines

The slopes of perpendicular lines are ____



If Line 1 and Line 2 are perpendicular to each other, then

Slope of Line 1	Slope of Line 2
$\frac{2}{3}$	
5	
–8	
$-\frac{4}{5}$	

Negative (Opposite) Reciprocals

$\frac{a}{b}$ and $-\frac{b}{a}$

Example 2: Give the equation of the line passing through the point (8, 3) that is **perpendicular** to the line $y = -2x + 3$.

Section 10.3 – You Try

Give the equation of the line passing through the point (–4, 1) that is:

a. **Parallel** to the line $y = 2x - 5$.

b. **Perpendicular** to the line $y = 2x - 5$.

Section 10.4: Applications – Slope-Intercept Form

Slope-Intercept Form	**If we are not given the slope and vertical intercept, we need:**
$y = mx + b$ $\quad$ $f(x) = mx + b$ m = slope = rate of change b = vertical intercept (initial value)	• One point and the slope • Two points

Example 1: You have just bought a new Sony 55” 3D television set for $2300. The TV’s value decreases at a rate of $250 per year. Construct a linear function to represent this situation.

Example 2: In 1998, the cost of tuition at a large Midwestern university was $144 per credit hour. In 2008, tuition had risen to $238 per credit hour. Determine a linear equation to represent the cost, C, of tuition as a function of *x*, the number of years since 1990.

Section 10.4 – YOU TRY

For each of the following, determine a linear equation to represent the given situation. Use the indicated variables and proper function notation.

a. A tree is 3 feet tall when it is planted, and it grows by approximately half a foot each year. Let H represent the height of the tree (in feet) after t years.

b. The enrollment at a local charter has been decreasing linearly. In 2006, there were 857 students enrolled. By 2015, there were only 785 students enrolled. Let S represent the number of students enrolled in this school n years after the year 2000.

Section 10.5
Interpreting a Linear Function in Slope-Intercept Form

Example 1: The function $A(m) = 200 - 1.25m$ represents the balance in a bank account (in thousands of dollars) after m months.

a. Identify the slope of this linear function and interpret its meaning in a complete sentence.

b. Identify the vertical intercept. Write it as an ordered pair and interpret its practical meaning in a complete sentence.

Ordered Pair:__________________

c. Determine the horizontal intercept of this linear function. Write it as an ordered pair and interpret its practical meaning in a complete sentence.

Ordered Pair:__________________

d. Determine $A(12)$. Write your answer as an ordered pair and interpret its practical meaning in a complete sentence.

Ordered Pair:__________________

e. How long will it take for the balance in this account to reach $80,000? Write the corresponding ordered pair.

Ordered Pair:__________________

Section 10.5 – You Try

The function $E(t) = 3860 - 77.2t$ gives the surface elevation (in feet above sea level) of Lake Powell t years after 1999. Your answers must include all appropriate units.

a. Identify the slope of this linear function and interpret its meaning in a complete sentence.

b. Identify the vertical intercept. Write it as an ordered pair and interpret its practical meaning in a complete sentence.

Ordered Pair:__________________

c. Determine the horizontal intercept. Write it as an ordered pair and interpret its practical meaning in a complete sentence.

Ordered Pair:__________________

d. Determine $E(5)$. Write your answer as an ordered pair and interpret its practical meaning in a complete sentence.

Ordered Pair:__________________

Unit 10: Practice Problems

Skills Practice

1. Complete the table below.

Equation	Slope	Behavior	Vertical Intercept
$y = x - 2$			
$f(a) = 6 - 4a$			
$\mathrm{P}(n) = 3n$			
$y = 4$			
$x = 7$			
$y = \frac{3}{5}x - 4$			
$y = x$			
$B(x) = 8 - x$			
$V(t) = -70$			

2. Determine the horizontal intercepts for each of the following.

a. $y = x - 2$

b. $f(a) = 6 - 4a$

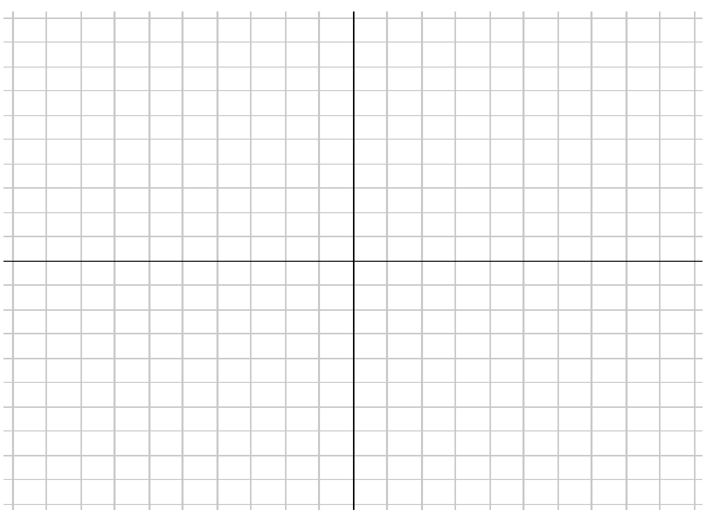
c. $P(n) = 3n$

d. $y = 4$

e. $x = 7$

f. $y = \frac{3}{5}x - 4$

3. Draw an **accurate** graph of the function $f(x) = 4x + 5$.

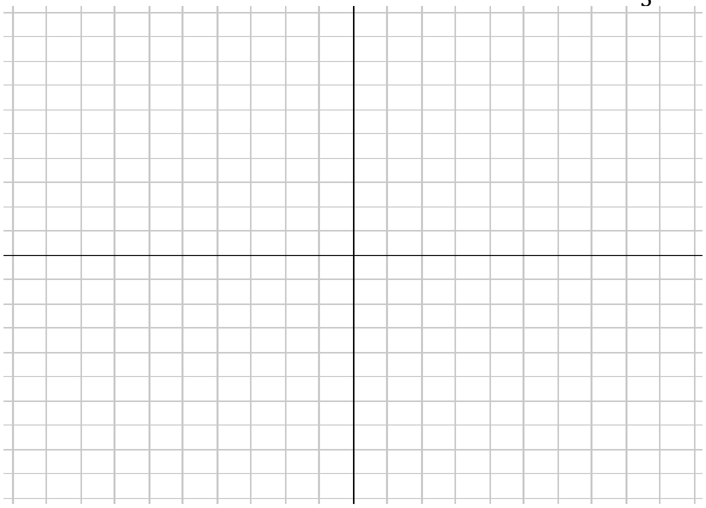


Slope: ___________

Vertical Intercept: ____________

Horizontal Intercept: ____________

4. Draw an **accurate** graph of the function $y = \frac{2}{5}x - 3$

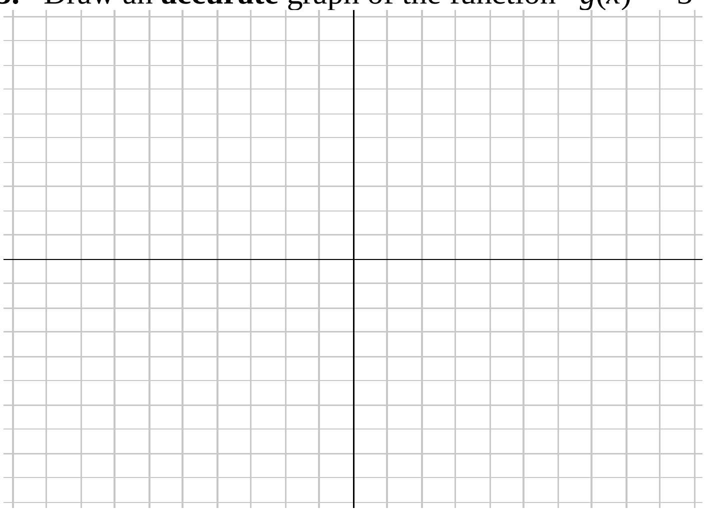


Slope: ___________

Vertical Intercept: ____________

Horizontal Intercept: ____________

5. Draw an **accurate** graph of the function $g(x) = 3 - x$.

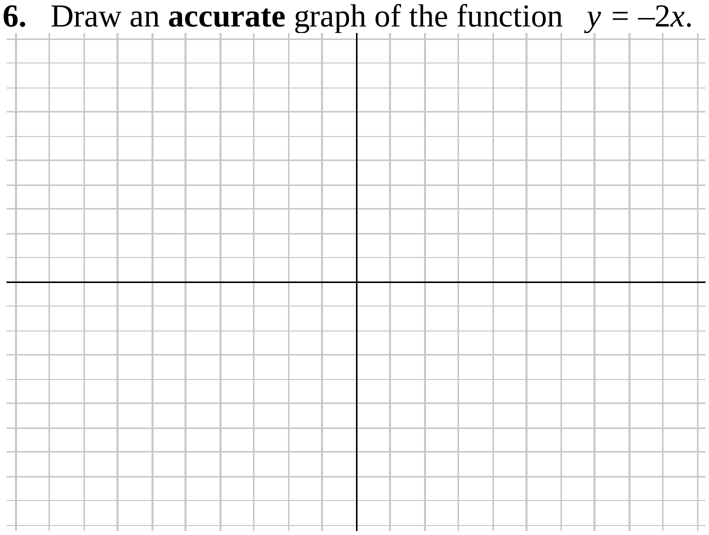


Slope: ___________

Vertical Intercept: ____________

Horizontal Intercept: ____________

6. Draw an **accurate** graph of the function $y = -2x$.

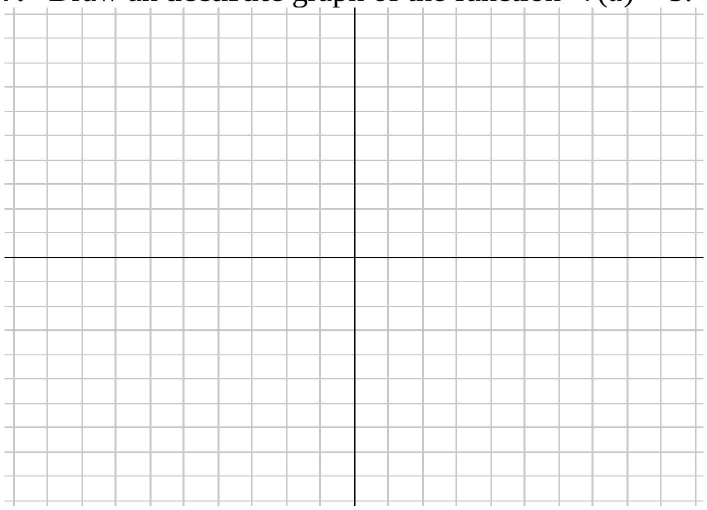


Slope: ___________

Vertical Intercept: ____________

Horizontal Intercept: ____________

7. Draw an **accurate** graph of the function $r(a) = 5$.

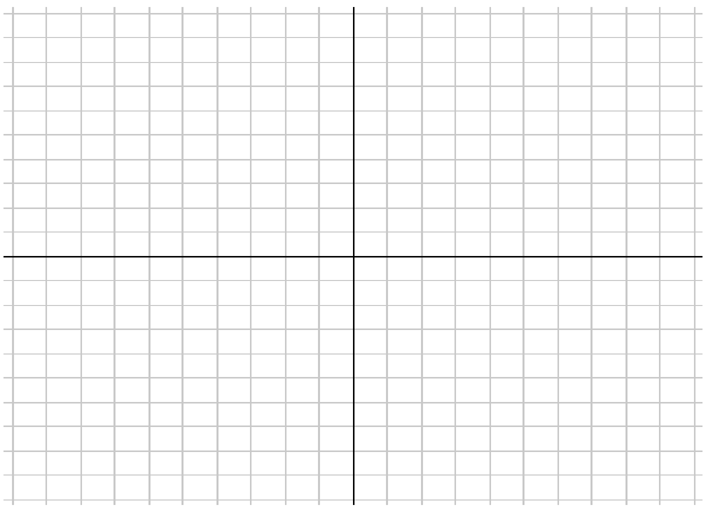


Slope: ____________

Vertical Intercept: _____________

Horizontal Intercept: _____________

8. Draw an **accurate** graph of the function $C(x) = \frac{x}{5}$

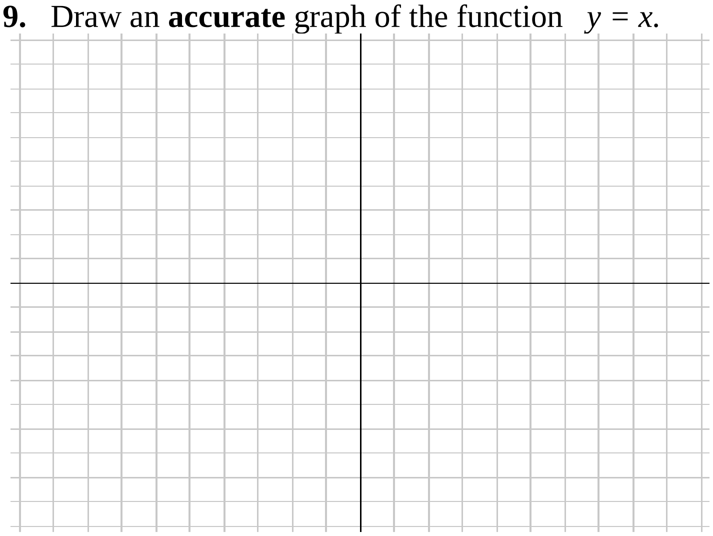


Slope: ____________

Vertical Intercept: _____________

Horizontal Intercept: _____________

9. Draw an **accurate** graph of the function $y = x$.



Slope: ____________

Vertical Intercept: _____________

Horizontal Intercept: _____________

10. Determine the equation of the line between each of the following pairs of points.

a. (4, –5) and (2, 3)

b. (–3, 2) and (1, 8)

c. (5, –9) and (5, 2)

d. (2, –1) and (–2, 3)

e. (4, 3) and (12, –3)

f. (2, –4) and (7, –4)

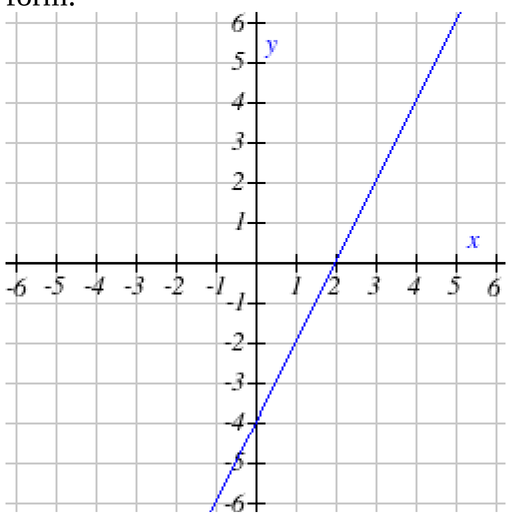
11. Give the equation of the linear function that generates the following table of values. Write your answer in slope-intercept form.

x	$f(x)$
–5	91
–2	67
1	43
4	19
9	–21

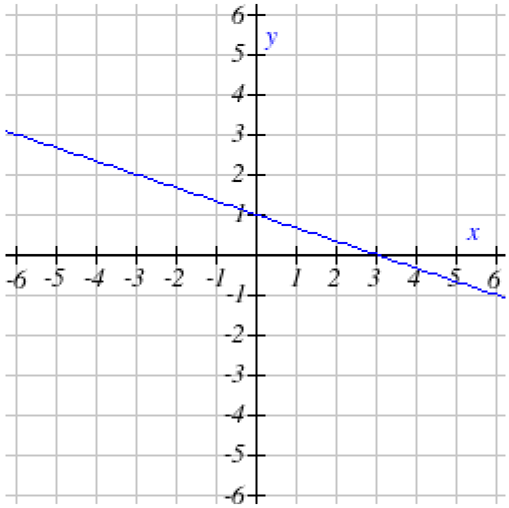
12. Give the equation of the linear function that generates the following table of values. Write your answer in slope-intercept form.

t	$C(t)$
5	–1250
15	–900
20	–725
35	–200
45	150

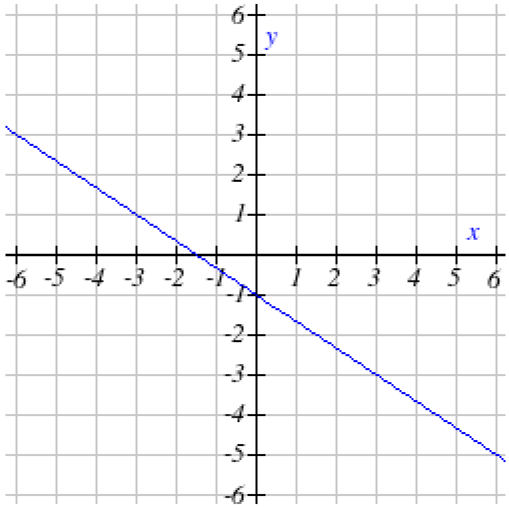
13. Give the equation of the linear function shown below. Write your answer in slope-intercept form.



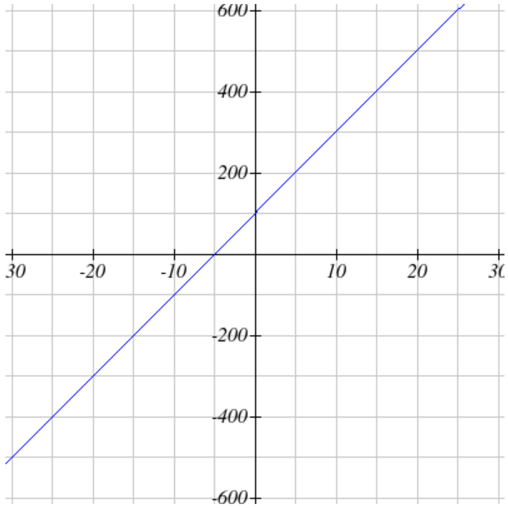
14. Give the equation of the linear function shown below. Write your answer in slope-intercept form.



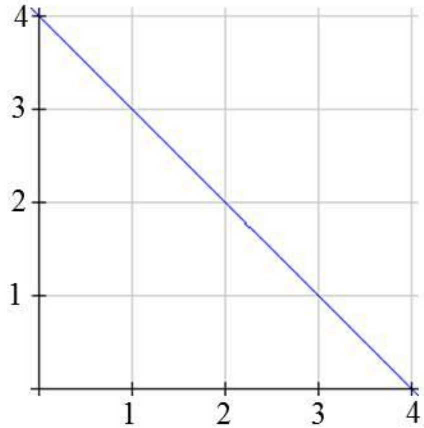
15. Give the equation of the linear function shown below. Write your answer in slope-intercept form.



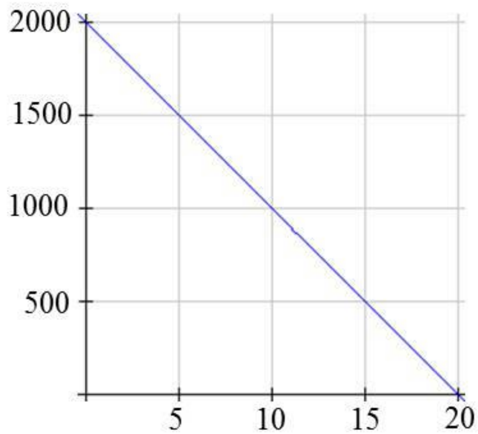
16. Give the equation of the linear function shown below. Write your answer in slope-intercept form.



17. Give the equation of the linear function shown below. Write your answer in slope-intercept form.



18. Give the equation of the linear function shown below. Write your answer in slope-intercept form.



19. Give the equation of the horizontal line passing through the point (–6, 11). _______________

20. Give the equation of the vertical line passing through the point (4, 7). ________________

21. Give the equation of the *x*-axis. ________________

22. Give the equation of the *y*-axis. ________________

23. Give the equation of the line passing through the point (1, –5) that is parallel to $y = 12 - 8x$.

24. Give the equation of the line passing through the point (4, 0) that is parallel to $y = 9 - \frac{3}{2}x$.

25. Give the equation of the line passing through the point (10, 3) that is perpendicular to $y = \frac{2}{5}x + 1$.

26. Give the equation of the line passing through the point (–12, –1) that is perpendicular to $y = 3 - 4x$.

Applications

27. A candy company has a machine that produces candy canes. The number of candy canes produced depends on the amount of time the machine has been operating. The machine produces 160 candy canes in five minutes. In twenty minutes, the machine can produce 640 candy canes.
    a. Determine the equation of the linear function that represents this situation. Let C(x) represent the number of candy canes produced in x minutes. Write your answer in function notation.

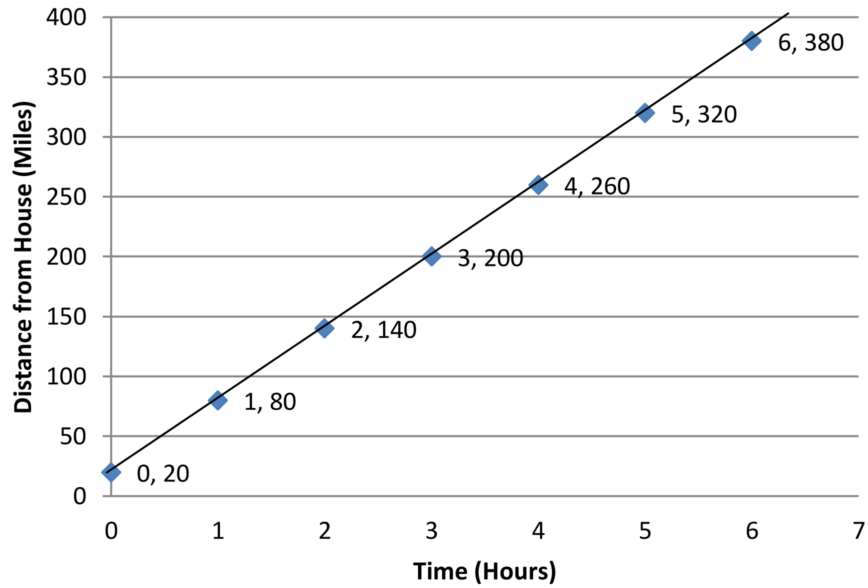
    b. Determine C(10). Write a sentence explaining the meaning of your answer.

    c. What is the practical meaning of the slope of this linear function? Include units.

    d. Determine horizontal intercept of this linear function. Write it as an ordered pair and interpret its meaning.

    e. How many candy canes will this machine produce in 1 hour?

28. Your workplace is 20 miles from your house. The graph below shows the distance you are from your house if you leave work and drive in the opposite direction.



a. Determine the equation of the linear function that represents this situation. Clearly indicate what each variable represents.

b. Use the equation from part a to determine how long it would take for you to be 500 miles from your house. Express your answer in hours and minutes.

c. How far from your house would you be after 12 hours?

d. Interpret the meaning of the slope of this linear function.

29. A local carpet cleaning company charges $10 for each room plus a reservation fee of $25. They clean a maximum of 12 rooms. Also, they have the policy that once a reservation is made, if you cancel, the reservation fee is non-refundable.

a. Determine the equation of the linear function C(*n*) that represents the total cost for cleaning *n* rooms.

b. Complete the table below. Graph the results, and decide if it would make sense to connect the data points on the graph.

n	C(*n*)
0	
1	
2	
3	
6	
12	

30. Water is leaking out of a tank at a constant rate of 1 gallon every 2 minutes. The tank initially held 30 gallons of water.

a. Determine the equation of the linear function A(t) that represents the amount of water (in gallons) remaining in the tank after t minutes.

b. Complete the table below. Graph the results, and decide if it would make sense to connect the data points on the graph.

t	A(t)
0	
1	
2	
3	
5	
10	
60	

31. With good credit, and a \$5000 down payment, you can finance a new Chevrolet Camaro convertible for 60 months for \$615.17 per month.
    a. Determine the equation of the linear function, $T(n)$, that represents the total amount paid for this car after n months.

    b. Use the equation from part a to determine the total payment over the 60-month time period.

    c. A new Chevrolet Camaro convertible has a base MSRP of \$35,080. Why is this value lower than your answer in part b? What is the difference?

32. The function $P(n) = 455n - 1820$ represents a computer manufacturer's profit when n computers are sold.

    a. Identify the slope, and interpret its meaning in a complete sentence.

    b. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

    c. Determine the horizontal intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

33. John is a door to door vacuum salesman. His weekly salary is given by the linear function $S(v) = 200 + 50v$, where v is the number of vacuums sold.

    a. Identify the slope, and interpret its meaning in a complete sentence.

    b. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

34. The function $V(n) = 221.4 + 4.25n$ gives the value, in thousands of dollars, of an investment after n years.

    a. Identify the slope, and interpret its meaning in a complete sentence.

    b. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

35. The function $V(t) = 86.4 - 1.2t$ gives the value, in thousands of dollars, of an investment after t years.

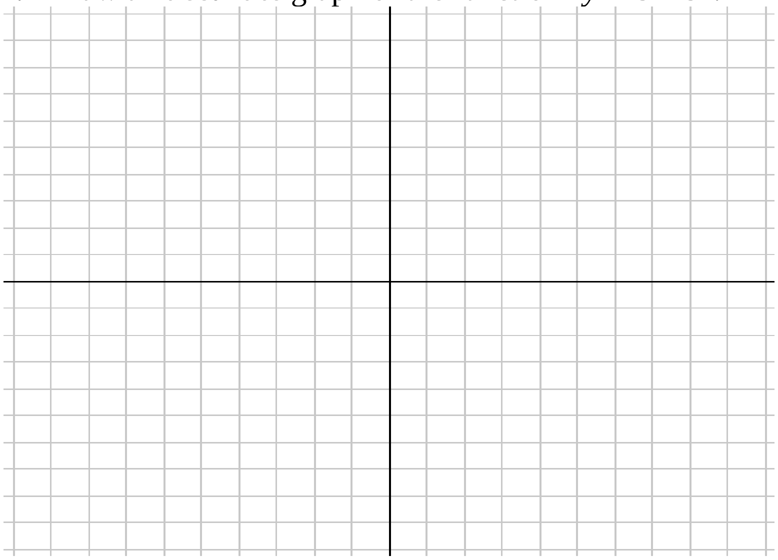
    a. Identify the slope, and interpret its meaning in a complete sentence.

    b. Identify the vertical intercept. Write it as an ordered pair and interpret its meaning in a complete sentence.

    c. Determine the horizontal intercept. Write it as an ordered pair and discuss its meaning.

Unit 10: Review

1. Draw an **accurate** graph of the function $y = 3 - 5x$.



Slope: ____________

Vertical Intercept: ____________

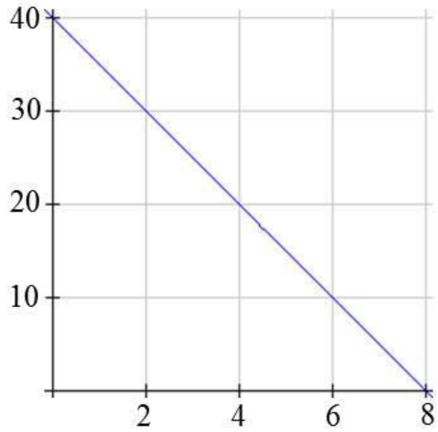
Horizontal Intercept: __________

2. Determine the equation of the line between the points (4, 3) and (12, –3). Your answer must be written in slope-intercept form.

3. Give the equation of the vertical line passing through the point (1, 8). ________________

4. Give the equation of the horizontal line passing through the point (1, 8). ________________

5. Give the equation of the linear function shown below. Write your answer in slope-intercept form.



6. In the year 2000, the median cost for in-state tuition and fees at a public 4-year college was \$3412. In the year 2010, the median cost for tuition had risen to \$7231.

   a. Determine a linear function, $C(t)$ to represent the cost for tuition and fees t years since 2000. Show all of your work. Write your answer in function notation, $C(t) = mt + b$.

   b. Determine $C(13)$. Show all of your work. Write your answer in a complete sentence.

   c. Identify the slope of this linear function and write a sentence explaining its meaning in this situation.

Unit 11: Linear Equations and General Form

Unit 11 Notes

Unit 11: Video Lesson

Section 11.1: General Form: $ax + by = c$

Slope-Intercept Form of a Linear Equation	**General (Standard) Form of a Linear Equation**
$y = mx + b$	$ax + by = c$
x = input, y = output m = slope b = vertical intercept $(0, b)$	x = input, y = output a, b, and c are constants

Example 1: Consider the linear equation $3x - 5y = 30$

a. Write this equation in slope-intercept form.

b. Identify the slope.

Determining Intercepts:
To find the **vertical intercept**, set $x = 0$ and solve for y.
To find the **horizontal intercept**, set $y = 0$ and solve for x.

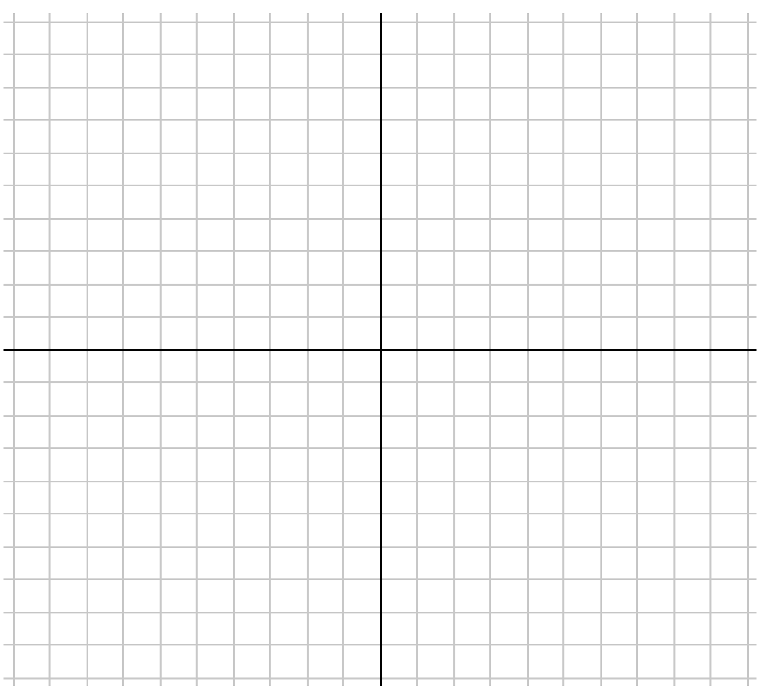
c. Determine the vertical intercept.

d. Determine the horizontal intercept.

Example 2: Draw an **accurate** graph of the function $3x + 2y = 16$.

Slope-Intercept Form:

____



Slope: __________

Vertical Intercept:

____

Horizontal Intercept:

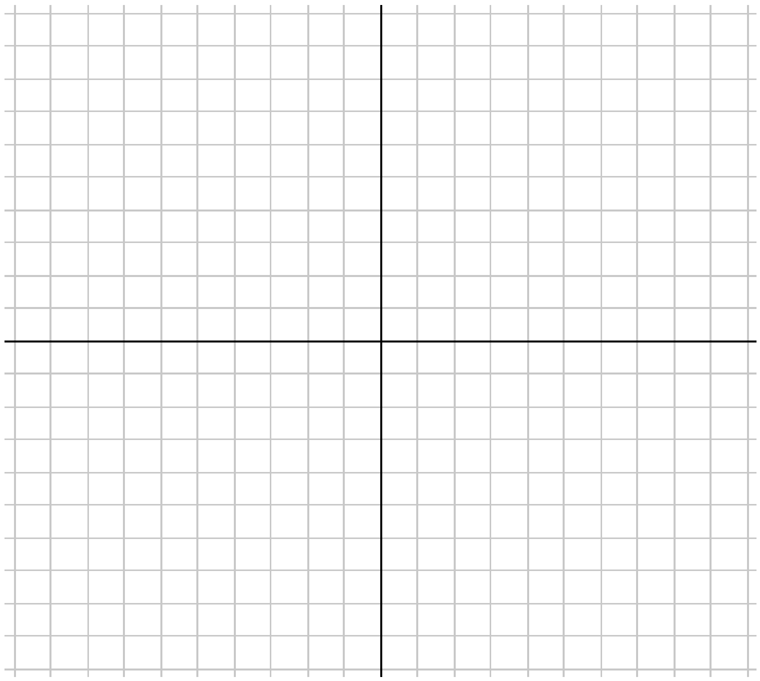
____

Additional points on the line:

____

Section 11.1 – YOU TRY

Draw an **accurate** graph of the function $4x - y = 7$



Slope-Intercept Form:

____

Slope: __________

Vertical Intercept: _________

Horizontal Intercept: _______

Additional points on the line:

____

Section 11.2: Applications – General Form

Example 1: Movie tickets cost $7 for adults (matinee), $5.50 for children. A total of $668 was collected in ticket sales for the Saturday matinee.

a. Write an equation representing the total amount of money collected.

b. If 42 adult tickets were purchased for this matinee, how many children were there?

Section 11.2 – YOU TRY

Tickets to a 3D movie cost $12.50 for adults and $8.50 for children. A total of $932 was collected in ticket sales for the 7:15PM show.

a. Write an equation representing the total amount of money collected.

b. If 17 children's tickets were purchased, how many adults were there?

Unit 11: Practice Problems

Skills Practice

1. Which of the ordered pairs below satisfy the **equation** $x - y = 5$?

   (-2, 3) (6, 1) (0, -5) (-3, -8)

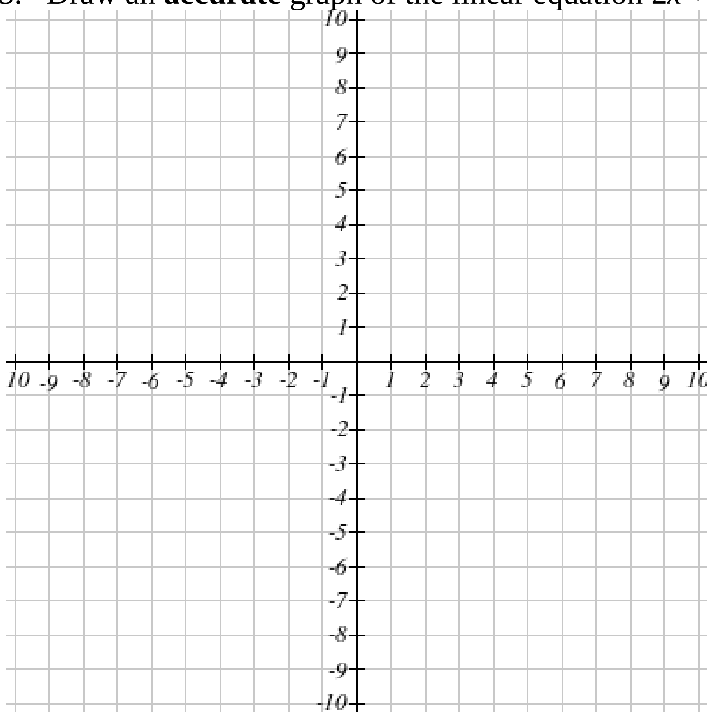
2. Which of the ordered pairs below satisfy the **equation** $2x + 3y = 6$?

   (0, 3) (6, -2) (3, 0) (-3, 4)

3. Write the equation $x - y = 5$ in Slope-Intercept Form.

4. Write the equation $2x + 3y = 6$ in Slope-Intercept Form.

5. Draw an **accurate** graph of the linear equation $2x + 4y = 12$.



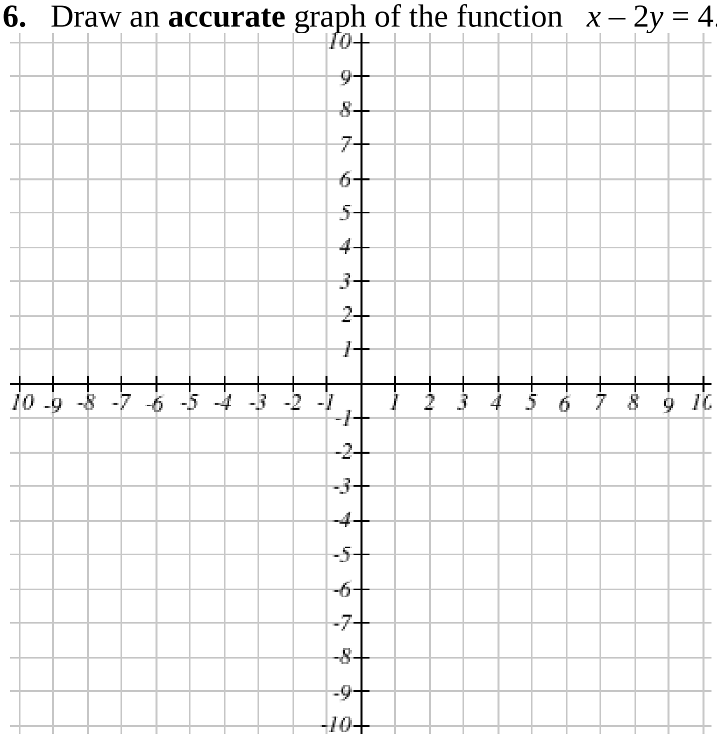
Slope-Intercept Form:

Slope: ____________

Vertical Intercept: _____________

Horizontal Intercept: _____________

6. Draw an **accurate** graph of the function $x - 2y = 4$.



Slope-Intercept Form:

Slope: ____________

Vertical Intercept: _____________

Horizontal Intercept: _____________

Applications

7. At a concession stand, three hot dogs and five sodas cost \$18.50.
   a. Let h represent the price of each hot dog, and s represent the price of each soda. Write a linear equation in general form to represent this situation.

   b. If hot dogs cost \$3.25 each, how much is each soda?

8. The Science Museum charges \$14 for adult admission and \$11 for each child. The museum bill for a school field trip was \$896.
   a. Write a linear equation in general form to represent this situation. Clearly indicate what each variable represents.

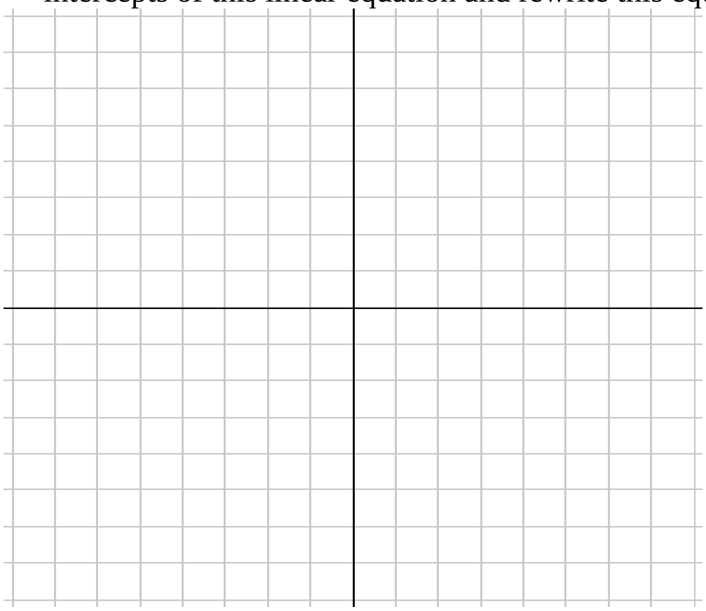
   b. Nine adults attended the field trip. How many children were there?

9. Bill begins a 50 mile bicycle ride. Unfortunately, his bicycle chain breaks, and he is forced to walk the rest of the way. Bill walks at a rate of 4 miles per hour, and rides his bike at a rate of 18 miles per hour.
   a. Let b represent the amount of time Bill spent bicycling before the chain broke, and w represent the amount of time Bill spent walking. Write a linear equation in general form to represent this situation. (Hint: Distance = rate · time)

   b. Bill had been riding his bike for two hours when the chain broke. Use the equation in part a to determine the amount of time he spent walking.

Unit 11: Review

1. Draw an **accurate** graph of the linear equation $2x + 3y = 6$. Determine the slope and intercepts of this linear equation and rewrite this equation in Slope-Intercept Form.



Slope-Intercept Form:

Slope: ___________

Vertical Intercept: ____________

Horizontal Intercept: ____________

2. At the movies, two popcorns and three sodas cost $13.
   a. Let *p* represent the price of each popcorn, and *s* represent the price of each soda. Write a linear equation in general form to represent this situation.

   b. If a popcorn cost $4.25 each, how much is each soda?

Unit 12: Systems of Equations

Unit 12 Notes

Unit 12: Video Lesson

Section 12.1: Systems of Linear Equations

Two linear equations that relate the same two variables are called a **system of linear equations.**

The Solution to a System of Linear Equations
A **solution** to a system of linear equations is an **ordered pair** that satisfies both equations.

Example 1: Verify that the point (5, 4) is a solution to the system of equations

$$y = 2x - 6$$
$$y = x - 1$$

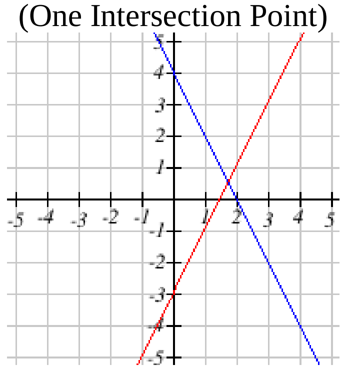
Types of Solutions to a Linear System of Equations

Graphically, the solution to a system of linear equations it a point at which the graphs intersect.

Types of Solutions to a Linear System of Equations:

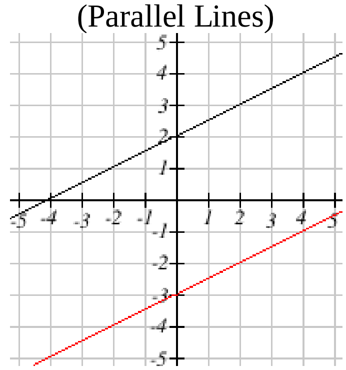
- **One unique solution**: The lines intersect at exactly one point
- **No solution**: The two lines are parallel and will never intersect
- **Infinitely many solutions**: This occurs when both lines graph as the same line

One Unique Solution
(One Intersection Point)



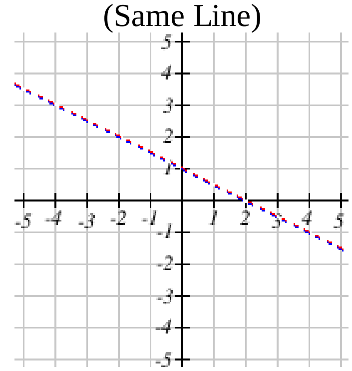
Consistent and Independent

No Solution
(Parallel Lines)



Inconsistent

Infinitely Many Solutions
(Same Line)



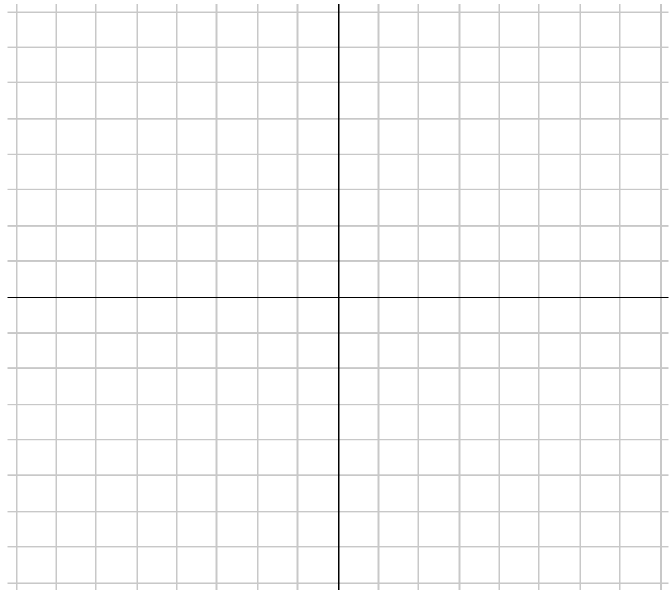
Consistent and Dependent

Solving a System of Linear Equations by Graphing

Example 2: Solve the system of equations by graphing. Check your answer.

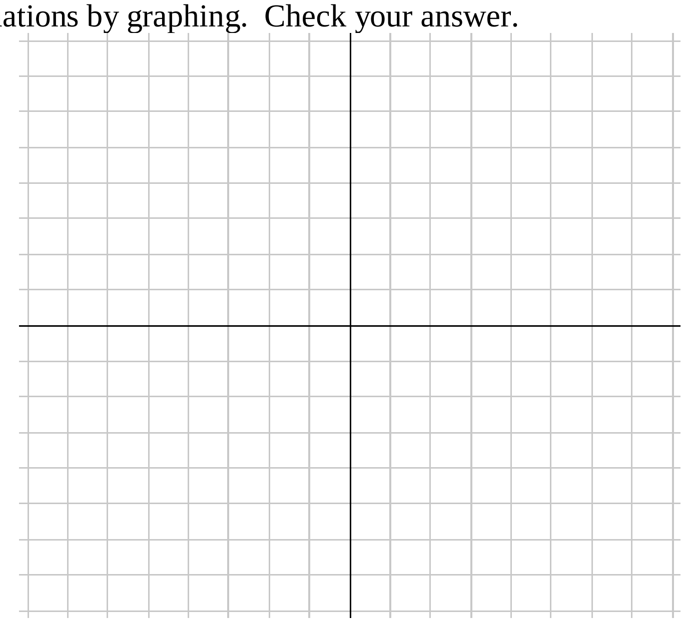
$y = 6 - \frac{2}{3}x$

$y = x + 1$



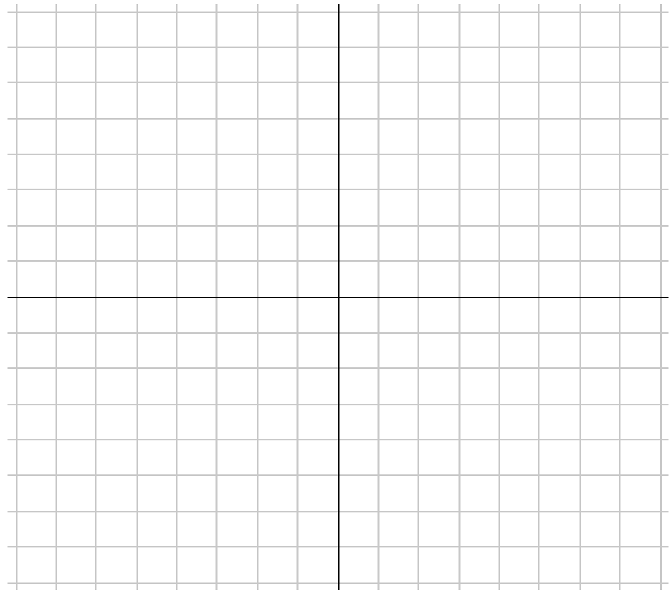
Example 3: Solve the system of equations by graphing. Check your answer.

$4x - 3y = -18$
$2x + y = -4$



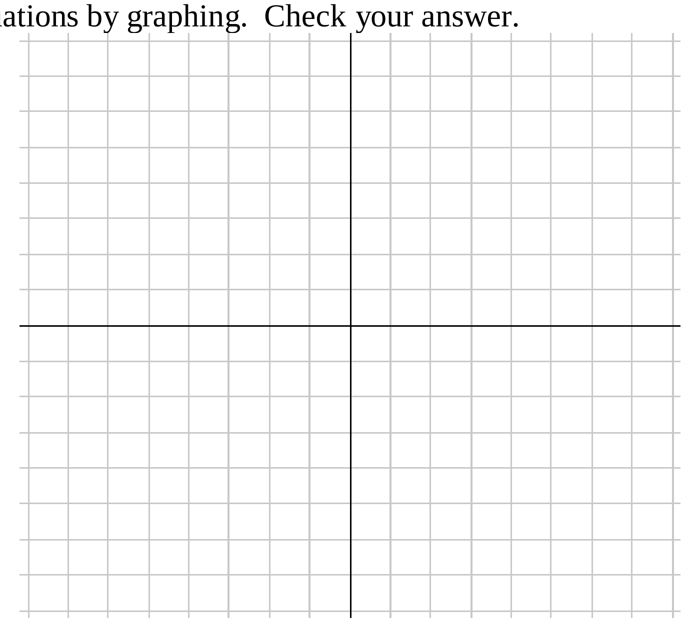
Example 4: Solve the system of equations by graphing. Check your answer.

$x - 3y = 3$
$3x - 9y = -18$



Example 5: Solve the system of equations by graphing. Check your answer.

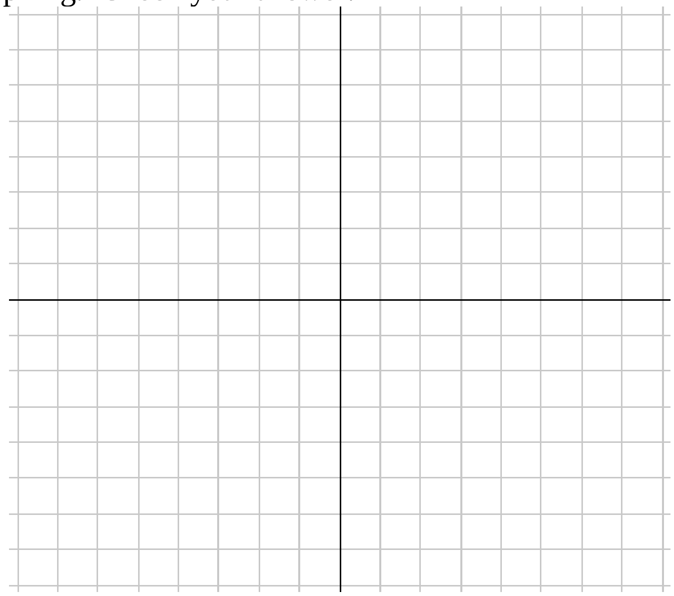
$2x + y = 3$
$6x + 3y = 9$



You Try

Solve the system of equations by graphing. Check your answer.

$x - y = 2$
$x + y = 6$



Verify that your solution is correct:

Section 12.2: The Substitution Method

Consider the following equations: $y = 2x$
$x + y = 3$

Using Substitution to Solve a Linear System of Equations
Step 1: Solve one of the equations of the system for one of the variables.
Step 2: Substitute the expression for the variable obtained in step 1 into the other equation.
Step 3: Solve the equation.
Step 4: Substitute the result back into one of the original equations to find the ordered pair solution.
Step 5: Check your result by substituting your result into either one of the original equations.

Example 1: Solve the system of equations using the Substitution Method.

$3x – 2y = 16$
$2x + y = 20$

Example 2: Solve the system of equations using the Substitution Method.

$5x – 4y = 9$
$x – 2y = –3$

Example 3: Solve the system of equations using the Substitution Method.

$3x + y = 5$

$6x + 2y = 11$

Example 4: Solve the system of equations using the Substitution Method.

$x - y = -1$

$y = x + 1$

Section 12.2 – You Try

Solve the system of equations using the Substitution Method. Check your answer.

$x - 2y = -11$

$5x + 2y = 5$

Section 12.3: The Addition (Elimination) Method

Consider the following systems of equations:

$x - 2y = -11$
$5x + 2y = 5$

Using the Addition (Elimination) Method to Solve a Linear System of Equations

Step 1: "Line up" the variables.

Step 2: Determine which variable you want to eliminate. Make those coefficients opposites.

Step 3: Add straight down (one variable should "drop out")

Step 4: Solve resulting equation

Step 5: Substitute this result into either of the ORIGINAL equations

Step 6: Solve for the variable

Step 7: CHECK!!!!!!! Plug solution into BOTH equations!

Example 1: Solve the system of equations using the Addition (Elimination) Method.

$4x - 3y = -15$
$x + 5y = 2$

Example 2: Solve the system of equations using the Addition (Elimination) Method.

$3x - 2y = -12$
$5x - 8y = 8$

Example 3: Solve the system of equations using the Addition (Elimination) Method.

$7x - 2y = 41$
$3x - 5y = 1$

Section 12.3 – You Try

Solve the system of equations using the Addition (Elimination) Method. Check your answer.

$2x + 3y = 18$
$x - y = 4$

Section 12.4: Applications

Example 1: Movie tickets cost $7 for adults (matinee), $5.50 for children. There are 218 seats in the theater. A total of $1,463 was collected in ticket sales for the sold-out Saturday matinee. How many adults and how many children were in the theater?

a. Write an equation representing the total number of tickets sold.

b. Write an equation representing the total amount of money collected from the sale of all tickets.

c. Solve this system of linear equations.

Section 12.4 – You Try

Tickets to a 3D movie cost $12.50 for adults and $8.50 for children. The theater can seat up to 180 people. A total of $1,826 was collected in ticket sales for the sold-out 7:15P show. Determine the number of adult tickets and the number of children's tickets that were sold.

a. Write an equation representing the total number of tickets sold. Clearly indicate what each variable represents.

b. Write an equation representing the total amount of money collected from the sale of all tickets.

c. Solve this system of linear equations.

Number of adult tickets sold: ____________

Number of children's tickets sold: ____________

Unit 12: Practice Problems

Skills Practice

1. Is the point (6, 1) a solution to the system of equations below? You must show correct work to justify your answer.

$$y = x - 5$$
$$y = 2x + 4$$

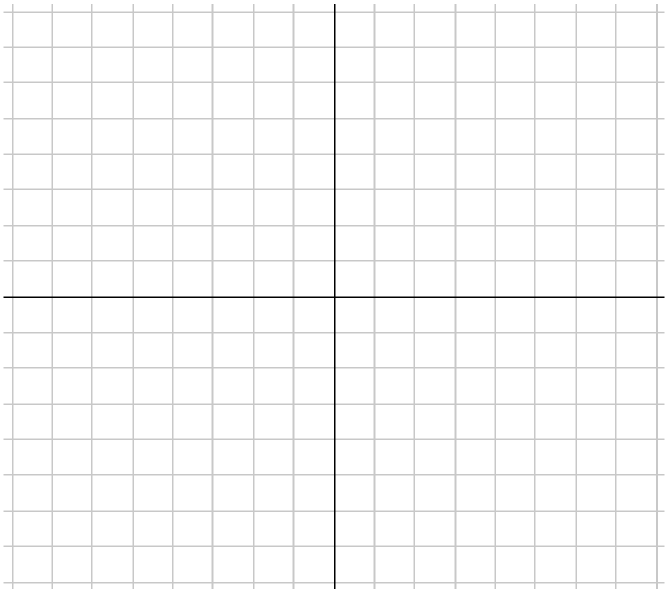
2. Is the point (–2, 5) a solution to the system of equations below? You must show correct work to justify your answer.

$$2x + y = 1$$
$$3x - 2y = -16$$

3. Is the point (5, 3) a solution to the system of equations below? You must show correct work to justify your answer.

$$3x - 2y = 9$$
$$2x + 5y = 4$$

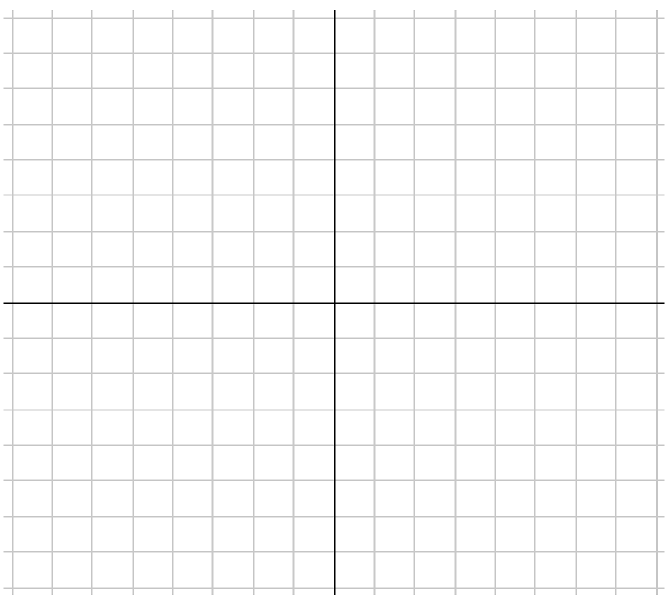
4. Solve the system of equations by **graphing**.   Your lines must extend accurately to the edge of the graph.   Verify that your solution is correct.



$y = 7 - x$
$y = 3x - 5$

Solution: ______________

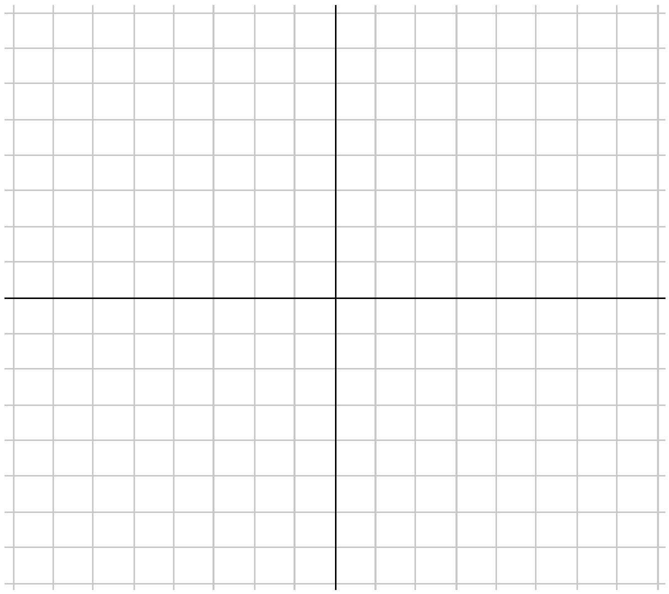
5. Solve the system of equations by **graphing**.   Your lines must extend accurately to the edge of the graph. Verify that your solution is correct.



$x - y = -2$
$x + y = 4$

Solution: ______________

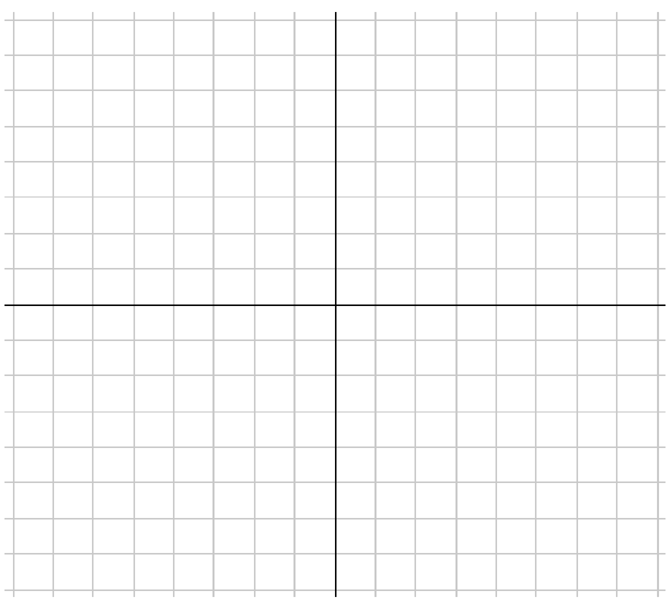
6. Solve the system of equations by **graphing**. Your lines must extend accurately to the edge of the graph. Verify that your solution is correct.



$x - 2y = 10$
$5x - y = -4$

Solution: ______________

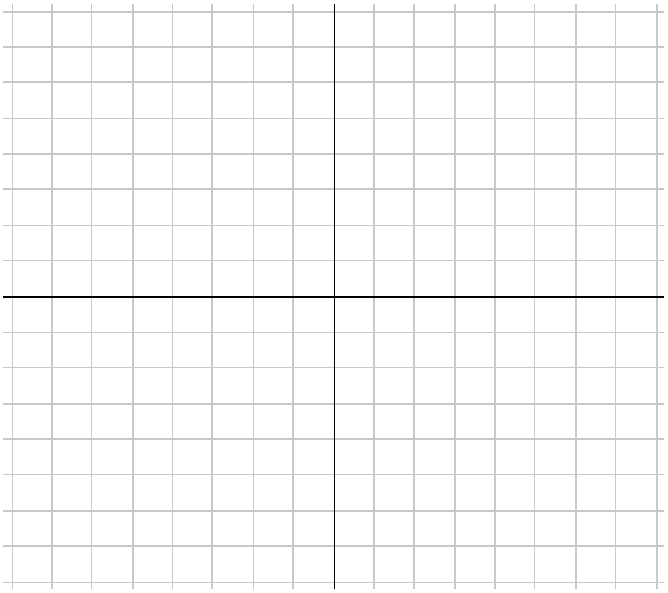
7. Solve the system of equations by **graphing**. Your lines must extend accurately to the edge of the graph. Verify that your solution is correct.



$3x - y = 8$
$-3x + y = 1$

Solution: ______________

8. Solve the system of equations by **graphing**. Your lines must extend accurately to the edge of the graph. Verify that your solution is correct.



$x + 2y = -4$
$2x + 4y = -8$

Solution: ______________

9. Solve the system of equations using the **substitution** method. Show all steps.
$5x + y = 2$
$3x - 4y = 15$

Solution: _______________

10. Solve the system of equations using the **substitution** method. Show all steps.

$2x + y = 8$

$6x + 3y = 24$

Solution: _______________

11. Solve the system of equations using the **substitution** method. Show all steps.

$x - y = 9$

$5x + 3y = 21$

Solution: _______________

12. Solve the system of equations using the **addition (elimination) method**. Show all steps.

$-3x + 2y = 12$

$x + y = 16$

Solution: ______________

13. Solve the system of equations using the **addition (elimination) method**. Show all steps.

$3x - 2y = -12$

$12x - 8y = 22$

Solution: ______________

14. Solve the system of equations using the **addition (elimination) method**. Show all steps.

$3x + 2y = -18$

$4x - 3y = -24$

Solution: ______________

15. Solve the system of equations using the **addition (elimination) method**. Show all steps.
$5x + 2y = -10$
$3x + 4y = 8$

Solution: _______________

16. The functions $f(x)$ and $g(x)$ are defined by the following tables. At what point is $f(x) = g(x)$?

x	–2	–1	0	1	2	3	4
$f(x)$	11	8	5	2	–1	–4	–7

x	–2	–1	0	1	2	3	4
$g(x)$	7	6	5	4	3	2	1

Solution (write the ordered pair):__________________

17. The functions $f(x)$ and $g(x)$ are defined by the following tables. At what point is $f(x) = g(x)$?

x	–2	–1	0	1	2	3	4
$f(x)$	8	1	0	–1	–8	–27	–64

x	–2	–1	0	1	2	3	4
$g(x)$	8	10	12	14	16	18	20

Solution (write the ordered pair):__________________

Applications

18. Your yard is a mess, and you decide to hire a landscaper. The Greenhouse charges a $80 consultation fee plus $14 per hour for the actual work. Garden Pros does not charge a consulting fee, but charges $30 per hour for the actual work.

    a. Write an equation that describes the cost, C, if you hire The Greenhouse for *h* hours of work.

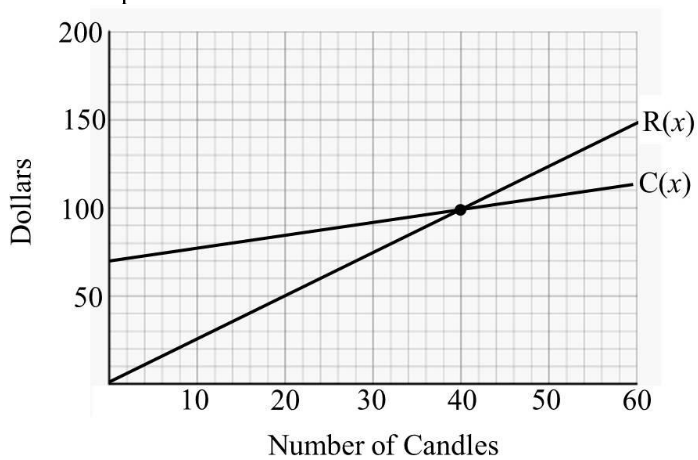
    b. Write a second equation that describes Garden Pros' charge, C, for *h* hours of work.

    c. Solve this system of linear equations. Write your answer as an ordered pair.

    d. Interpret the solution in a complete sentence.

    e. Your yard needs a lot of work, and you anticipate that the job will take at least 6 hours. Which service do you choose? Why?

19. The graph below shows the cost and revenue for a company that produces and sells scented candles. The function R(x) gives the revenue earned when x candles are sold. The function C(x) gives the total cost to produce x candles.



a. Discuss the significance of the point (40, 100) in terms of the cost, revenue, and *profit* for this company.

b. What happens if *fewer than* 40 candles are sold?

c. What happens if *more than* 40 candles are sold?

20. At a concession stand, five hot dogs and five sodas cost $30. Two hot dogs and four sodas cost $15. Determine the price of each hot dog and each soda.

Price for each soda: ____________

Price for each hot dog:___________

21. The Science Museum charges $14 for adult admission and $11 for each child. The total bill for 68 people from a school field trip was $784. How many adults and how many children went to the museum?

Number of children _____________

Number of adults _____________

22. Tickets to a 3D movie cost $12.50 for adults and $8.50 for children. The theater can seat up to 260 people. A total of $1,734 was collected in ticket sales for the 7:15P show, in which only 60% of the tickets were sold. How many adults and how many children were in the theater?

Number of children _____________

Number of adults _____________

23. Emery invested \$10,000 in two mutual funds. Fund A earned 4% profit during the first year, while Fund B suffered a 2% loss. If she received a total of \$130 profit, how much had she invested in each mutual fund?

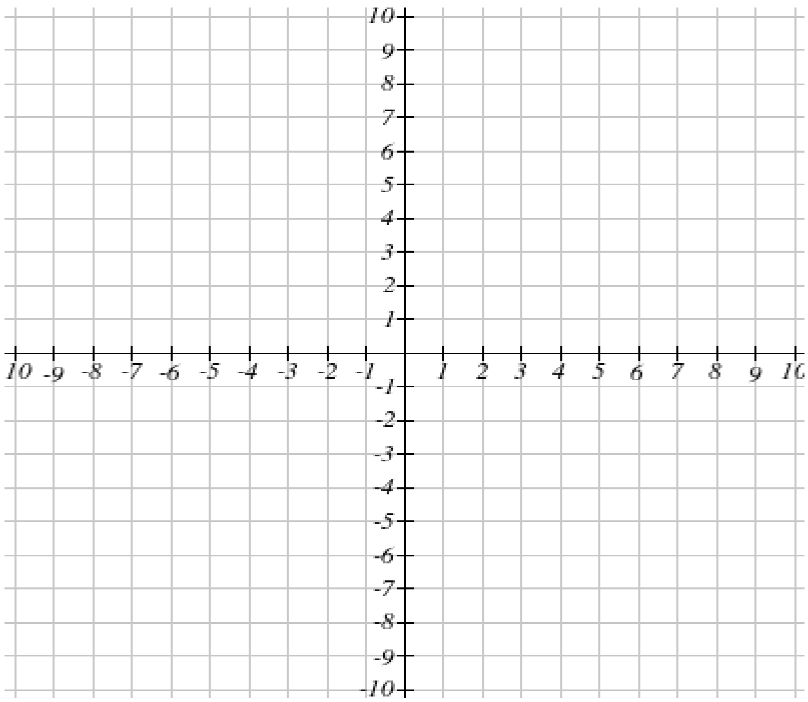
Amount invested in Fund A: ____________

Amount invested in Fund B: ____________

24. Bill begins a 100 mile bicycle ride. Unfortunately, his bicycle chain breaks, and he is forced to walk the rest of the way. The whole trip takes 6 hours. If Bill walks at a rate of 4 miles per hour, and rides his bike at a rate of 20 miles per hour, find the amount of time he spent walking. Write your answer in a complete sentence. (Hint: Distance = rate · time)

Unit 12: Review

1. Solve the system of equations by **graphing**.   Your lines must extend accurately to the edge of the graph. Verify that your solution is correct.



$4x - 3y = -18$
$3x + y = -7$

Solution: ______________

2. Solve the system of equations using the **substitution** method.   Show all steps. Verify that your solution is correct.

$2x - 3y = -19$
$x + 2y = 8$

Solution: _______________

3. The functions $f(x)$ and $g(x)$ are defined by the following tables. At what point is $f(x) = g(x)$?

x	**–2**	**–1**	**0**	**1**	**2**	**3**	**4**
***f*(*x*)**	4	1	0	1	4	9	16

x	**–2**	**–1**	**0**	**1**	**2**	**3**	**4**
***g*(*x*)**	-1	8	3	5	7	9	11

Solution (write the ordered pair):_________________

4. Jamaal invested $10,000 in two mutual funds. Fund A earned 6% profit during the first year, and Fund B earned 2% profit. If he received a total of $374 profit, how much had he invested in each mutual fund? Show all steps. Verify that your solution is correct.

Amount invested in Fund A: ____________

Amount invested in Fund B: ____________

Unit 13: Polynomials and Exponents

Unit 13 Notes

Unit 13: Video Lesson

Section 13.1: Polynomials

Definitions
Polynomial: An algebraic expression composed of the sum of terms containing a single variable raised to a non-negative integer exponent. **Monomial**: A polynomial consisting of **one** term **Binomial**: A polynomial consisting of **two** terms **Trinomial**: A polynomial consisting of **three** terms **Leading Term**: The term that contains the highest power of the variable in a polynomial **Leading Coefficient**: The coefficient of the leading term **Constant Term**: A number with no variable factors. A term whose value never changes. **Degree**: The highest exponent in a polynomial

Example 1: Complete the table.

Polynomial	Name	Leading Coefficient	Constant Term	Degree
$24a^6 + a^2 + 5$				
$2m^3 + m^2 - 2m - 8$				
$5x^2 + x^3 - 7$				

$-2x + 4$				
$4x^3$				

Section 13.1 – You Try

Complete the table.

Polynomial	Name	Leading Coefficient	Constant Term	Degree
$n^2 - 2n + 8$				
$4x^3$				
$6x - 7$				

Section 13.2: Operations on Polynomials

Addition of Polynomials

Example 1: Add. $(3n^2 - 2n + 8) + (3n^3 - 7n^2 - n - 9)$

Subtraction of Polynomials

Example 2: Subtract. $(a^3 + 5a + 11) - (4a^3 + 6a^2 - a + 1)$

Combine and Simplify

Example 3: Perform the indicated operations. Simplify.

$$(3x - 1) - (x^2 - x - 9) + (4x^3 + x^2 - 7x + 2)$$

Section 13.2 – YOU TRY

Perform the indicated operations. Simplify completely. Show all steps as in the media examples.

a. $(x^2 - x + 8) + (5x^2 - 6x - 11)$

b. $(8x^2 - 4x + 5) - (3x^2 - 4x + 6)$

c. $(5x + 8) + (x^2 - x - 1) - (x^3 + 3x^2 - 4x + 8)$

Section 13.3: Properties of Exponents

Given any real numbers $a, b, c, m,$ and n

$n^1 =$ ______ $1^n =$ ______ $n^0 =$ ______ ($n \neq 0$) $0^n =$ ______ ($n \neq 0$)

$3^4 =$ ______

$3^3 =$ ______

$3^2 =$ ______

$3^1 =$ ______

$3^0 =$ ______

$3^{-1} =$ ______

$3^{-2} =$ ______

$3^{-3} =$ ______

$3^{-4} =$ ______

Multiplication Properties of Exponents	
$a^m \cdot a^n = a^{m+n}$ Why?	$(a^m)^n = a^{mn}$ Why?

Example 1: Evaluate and simplify the following expressions.
Assume $x \neq 0$, $x \neq -1/2$, $a \neq 0$, $b \neq 0$, and $c \neq 0$.

$5x^0$ $(2x + 1)^0$ $a^0 + b^0 + c^0$

The Multiplication Property: $a^m \cdot a^n = a^{m+n}$

Example 2: Simplify the following expressions

$n^3 n^9$ $b^5 \cdot b^4 \cdot b$ $5x^2y^5(7xy^9)$

Raising a Power to a Power: $(a^m)^n = a^{mn}$

Example 3: Simplify the following expressions

$(x^3)^9$ $5b^2(b^5)^8$

Raising a Product to a Power: $(ab)^n = a^n b^n$

Example 4: Simplify the following expressions

$(5x)^2$ $(x^3y^2)^9$ $(-8ab^5)^2$

$5(-2w^7)^3$ $5n^4(-3n^3)^2$

Section 13.3 – You Try

Simplify the following expressions. Show all steps as in the media examples.

a. $(2x^4)^2$

b. $2(x^2)^3$

c. $8g^3 \cdot 5g^4$

d. $2n^0$

Section 13.4: Multiplication of Polynomials

Multiplication of Monomials

Example 1: Multiply and simplify.

$(3x^5)(-2x^9)$

The Distributive Property

Example 2: Expand and simplify.

$5x^3(2x^5 - 4x^3 - x + 8)$

Multiplication of Polynomials

Example 3: Multiply and simplify.

a. $(x + 3)(x + 4)$

b. $(m - 5)(m - 6)$

c. $(2d - 4)(3d + 5)$

d. $(x - 2)(x^2 + 2x - 4)$

Squaring a Binomial

Example 4: Multiply and simplify

a. $(n + 5)^2$

b. $(3 - 2a)^2$

Section 13.4 – You Try

Multiply and simplify. Show all steps as in the media examples.

a. $-3x^2(x^5 + 6x^3 - 5x)$

b. $(3x - 4)(5x + 2)$

c. $(2p - 5)^2$

Section 13.5: Division Properties of Exponents

The Division Property: $\frac{a^m}{a^n} = a^{m-n}$	$a \neq 0$

$$\frac{x^5}{x^2} = \frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x} = \frac{x \cdot x \cdot x}{1} = \frac{x^3}{1} = x^3 \qquad \frac{x^5}{x^2} = x^{5-2} = x^3$$

Example 1: Simplify the following expressions. Variables represent nonzero quantities.

$$\frac{x^{50}}{x^4} \qquad \frac{4a^{10}b^5}{6ab^2}$$

Raising a Quotient to a Power: $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$	$b \neq 0$

Example 2: Simplify the following expressions. Variables represent nonzero quantities.

$$\left(\frac{5}{7}\right)^2 \qquad \left(\frac{x^5}{y^3}\right)^4 \qquad \left(\frac{-4t^{10}}{u^6}\right)^2$$

Section 13.5 – You Try

Simplify the following expressions. Variables represent nonzero quantities. Show all steps as in the media examples.

a. $\left(\frac{3a^{10}}{7}\right)^2$

b. $\frac{6x^3y^8}{9xy^5}$

Section 13.6: Negative Exponents

For any real numbers $a \neq 0, b \neq 0,$ and m :

$$\left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^{m} \qquad a^{-m} = \frac{1}{a^m} \qquad \frac{1}{a^{-m}} = a^m$$

Example 1: Rewrite each of the following with only positive exponents. Variables represent nonzero quantities.

a. $x^{-3} =$

b. $\frac{1}{x^{-3}} =$

c. $2^{-3} =$

d. $\left(\frac{4}{5}\right)^{-2} =$

e. $3x^{-4} =$

f. $(3x)^{-4} =$

Example 2: Simplify the following expressions. Variables represent nonzero quantities. Write your answer with only positive exponents.

a. $p^{-4} \cdot p^2 \cdot p =$

b. $\frac{2}{3}a^{-5}b^{-3}c^2 =$

c. $\frac{d^{-2}}{d^{-7}} =$

d. $\frac{4t^{-10}u}{6t^{-3}u^{-1}} =$

Section 13.6 – You Try

Simplify the following expressions. Write the answers with only positive exponents. Variable represent nonzero quantities.

a. $\dfrac{7}{a^{-2}} =$

b. $n^{-2} \cdot n^{-3} \cdot n^{8}$

c. $\dfrac{4w^3x}{6wx^{-2}}$

d. $2\left(3x^2\right)^{-3}$

Section 13.7 Division on Polynomials

Simplify the following expressions. Write your answer with only positive exponents. Variables represent nonzero quantities.

Example 1: $\dfrac{-6w^8}{30w^3}$

Example 2: $\dfrac{3x-6}{2}$

Example 3: $\dfrac{6x^3+2x^2-4}{4x}$

Example 4: $\dfrac{20a^2+35a-4}{-5a^2}$

Section 13.7 – You Try

Simplify the following expression. Write your answer with only positive exponents. Variables represent nonzero quantities.

a. $\frac{11x-15}{3}$

b. $\frac{3x^2+5x-12}{3x^2}$

Section 13.8: Scientific Notation

Scientific notation is the way scientists easily handle very large numbers or very small numbers. For example, instead of writing 0.00000000000000092, we write 9.2×10^{-16}.

Powers of Ten

10^4	$10,000$
10^3	1000
10^2	100
10^1	10
10^0	1
10^{-1}	.1
10^{-2}	.01
10^{-3}	.001
10^{-4}	.0001

Scientific Notation	**Standard Form**
3.21×10^4	32,100
3.21×10^3	3210
3.21×10^2	321
3.21×10^1	32.1
3.21×10^0	3.21
3.21×10^{-1}	0.321
3.21×10^{-2}	0.0321
3.21×10^{-3}	0.00321
3.21×10^{-4}	0.000321

Writing Numbers in Scientific Notation and Standard Form

Scientific Notation	Standard Form
3.21×10^4	32,100
3.21×10^{-2}	0.0321

Example 1: Write the following numbers in standard form.

a. 5.9×10^{5}

b. 8.3×10^{-7}

Example 2: Write the following numbers in scientific notation.

a. $8{,}140{,}000$

b. 0.0000000091

On Your Calculator

Example 3: Evaluate the following on your calculator. Write in standard form.

a. 850^{6}

b. 0.25^{8}

Section 13.8 – You Try

Write the following numbers in standard form.

a. 4.9×10^{5}

b. $1.5\text{E}-3$

Write the following numbers in scientific notation.

c. 0.00000061

d. $5{,}430{,}000{,}000$

Unit 13: Practice Problems

Skills Practice

1. Complete the table below.

Polynomial	Name	Leading Coefficient	Constant Term	Degree
$5n^8 - n^5 + 1$				
$x - 5$				
$8r^2$				

2. Simplify completely. Show all steps, and box your answers.

a. $(2x)^3$

b. $5(3n)^2$

c. $y^3 \cdot y^7 \cdot y$

d. $(-2x)^3$

e. $5w(8w^3)$

f. $(-2x^5)^2$

g. $(-5w^8)^2$

h. $3x^0 + 2x^0$

i. $(-4x)^2 + 4x^2$

j. $(5x - 7)^0$

3. Multiply and simplify completely. Show all steps, and box your answers.

a. $4x^2(3x - 5)$

b. $4a^2(3a^2 - 2a - 5)$

c. $(p + 5)(p + 7)$

d. $(x + 2)(x - 2)$

e. $(2x - 4)(3x - 5)$

f. $(5w - 8)(3w + 11)$

g. $(x+2)^2$

h. $(2x-3)^2$

i. $(x-4)(x^2+x-5)$

j. $3(x+2)(x+4)$

k. $4(x+2)^2$

l. $(q-2)^3$

4. Simplify completely. Show all steps, and box your answers.

a. $\dfrac{x^8}{x^3}$

b. $\left(\dfrac{2}{5}\right)^4$

c. $\dfrac{8n^8p^5}{12np^4}$

d. $\left(\dfrac{3a^5}{7b}\right)^2$

5. Evaluate the algebraic expression x^2 given $x = -7$. Show your work.

6. Evaluate the algebraic expression $5x^3$ given $x = -2$. Show your work.

7. Evaluate the algebraic expression $(5x)^2$ given $x = -2$. Show your work.

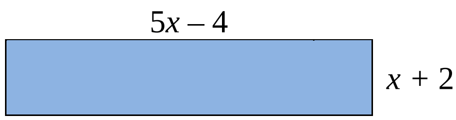
8. Evaluate the algebraic expression $5(2x)^2$ given $x = -3$. Show your work.

9. Evaluate the algebraic expression $\frac{6}{5x}$ given $x = -2$. Show your work.

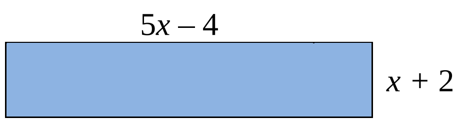
10. Evaluate the algebraic expression $\frac{1}{4x^2}$ given $x = -5$. Show your work.

Applications

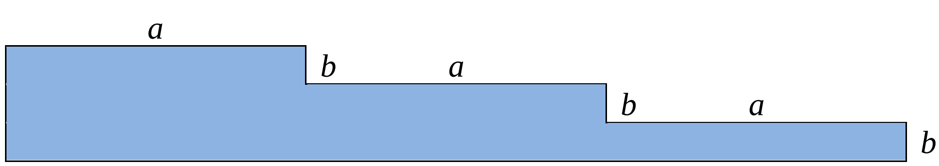
11. Write an algebraic expression that represents the perimeter of the figure shown below. Simplify completely. Show your work.



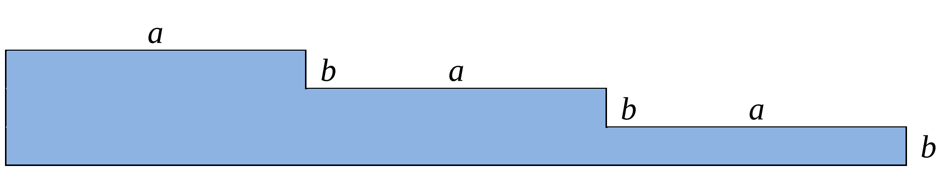
12. Write an algebraic expression that represents the total area of the figure shown below. Simplify completely. Show your work.



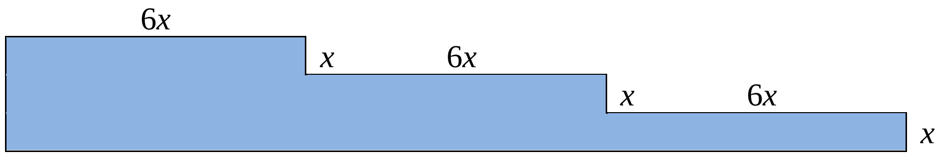
13. Write an expression that represents the perimeter of the figure shown below. Simplify completely.



14. Write an expression that represents the total area of the figure shown below. Simplify completely.



15. Write an algebraic expression that represents the total area of the figure shown below. Simplify completely. Show your work.



Unit 13: Review

1. Consider the polynomial $n^2 - 7n - 11$

   a. Is this a monomial, binomial, or trinomial? ______________________________

   b. Identify the constant term. ______________

   c. What is the leading coefficient? _____________

   d. What is the degree of this polynomial? _____________

   e. Identify the coefficient of the second term. _____________

2. If possible, simplify each of the following by combining like terms or using properties of exponents.

   a. $8n^3 + 5n^3 =$ ________________

   b. $8n^3 \cdot 5n^3 =$ ________________

   c. $8n^3 + 8n^5 =$ ________________

   d. $8n^3 \cdot 8n^5 =$ ________________

3. Simplify completely. Show all steps, and box your answers.

   a. $(-5x^5)^3$

   b. $4x^2(8x^2 - 5x - 3)$

   c. $(3 - 5x)^2$

   d. $\dfrac{24m^8}{18m^3}$

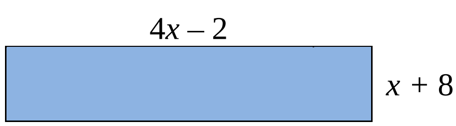
   e. $\left(\dfrac{5x}{3}\right)^2$

   f. $(4x^3 + 6x^2 - x + 7) - (3x^3 + x^2 - x - 5)$

4. Evaluate the algebraic expression $8(2x)^2$ given $x = -5$. Show your work.

5. Evaluate the algebraic expression $\frac{2}{3x^2}$ given $x = 4$. Show your work.

6. Write an algebraic expression that represents the perimeter of the figure shown below. Simplify completely. Show your work.



7. Write an algebraic expression that represents the total area of the figure shown below. Simplify completely. Show your work.