



Spring 2016

Student Workbook Options

FOR PRECALCULUS

Available Titles.....	page 1
Workbook Options by Feature.....	page 3
Explorations and Notes.....	page 5
Guided Lecture Notes.....	page 11
Guided Notebook.....	page 23
Learning Guide.....	page 33
MyNotes.....	page 43
Note-taking Guide.....	page 51
Video Notebook.....	page 59
Integrated Review (IR) Worksheets**	page 79

**IR worksheets can be purchased with both an Integrated Review MyMathLab course or a regular MyMathLab course.



Available Titles

Explorations and Notes

Schulz © 2014

Precalculus, First Edition ([Sample](#))

Guided Lecture Notes

Sullivan/Sullivan © 2015/17 Series

College Algebra Enhanced with Graphing Utilities, Seventh Edition

Algebra and Trigonometry Enhanced with Graphing Utilities, Seventh Edition

Precalculus Enhanced with Graphing Utilities, Seventh Edition ([Sample](#))

College Algebra: Concepts Through Functions, Third Edition

Precalculus: Concepts Through Functions, A Right Triangle Approach to Trigonometry, Third Edition

Precalculus: Concepts Through Functions, A Unit Circle Approach to Trigonometry, Third Edition

Sullivan © 2016 Series

College Algebra, Tenth Edition ([Sample](#))

Trigonometry, Tenth Edition

Algebra and Trigonometry, Tenth Edition

Precalculus, Tenth Edition

Guided Notebook

Trigsted © 2015 Series

College Algebra, Third Edition ([Sample](#))

College Algebra Interactive, First Edition

Trigonometry, Second Edition

Algebra & Trigonometry, Second Edition

Learning Guide

Blitzer © 2014 Series

College Algebra, Sixth Edition

College Algebra: An Early Functions Approach, Third Edition

College Algebra Essentials, Fourth Edition

Trigonometry, Eleventh Edition ([Sample](#))

College Algebra and Trigonometry, Sixth Edition

Precalculus, Sixth edition

MyNotes

Lial/Hornsby/Schneider/Daniels © 2015/17 Series

College Algebra, Twelfth Edition ([Sample](#))

Essentials of College Algebra, Eleventh Edition

Trigonometry, Eleventh Edition

College Algebra and Trigonometry, Sixth Edition

Precalculus, Sixth Edition

Note-taking Guide

Harshbarger/Yocco © 2017

College Algebra in Context with Applications for the Managerial, Life, and Social Sciences, Fifth Edition ([Sample](#))

Video Notebook

Beecher/Penna/Bittinger ©2014/16 Series

College Algebra, Fifth Edition ([Sample](#))

Algebra and Trigonometry, Fifth Edition

Precalculus, Fifth Edition

Bittinger/Beecher/Ellenbogen/Penna © 2017 Series

College Algebra: Graphs and Models, Sixth Edition ([Sample](#))

Algebra and Trigonometry: Graphs and Models, Sixth Edition

Precalculus: Graphs and Models, Sixth Edition



Available Titles

Dugopolski © 2015/17 Series

College Algebra, Sixth Edition

Trigonometry, Forth Edition ([Sample](#))

College Algebra and Trigonometry, Sixth Edition

Precalculus: Functions and Graphs,
MyMathLab Update, Forth Edition

Integrated Review (IR) Worksheets

Beecher/Penna/Bittinger © 2014/16 Series

College Algebra with Integrated Review,
Fifth Edition

Blitzer © 2015 Series

College Algebra with Integrated Review,
First Edition

Harshbarger/Yocco © 2017

College Algebra in Context with Integrated Review, Fifth Edition

Lial/Hornsby/Schneider/Daniels © 2015/17 Series

Essentials of College Algebra with Integrated Review, First Edition

College Algebra, Twelfth Edition

Rockswold © 2016 Series

College Algebra with Integrated Review,
First Edition ([Sample](#))

Sullivan © 2016 Series

College Algebra with Integrated Review,
Tenth Edition

Trigsted © 2015 Series

College Algebra with Integrated Review,
First Edition

Workbook Options	Learning Objectives	Extra Practice Problems	Extra Examples	Side-by-Side Examples and Practice	Video-Based Examples	End of Chapter Review	Vocab Exercises	Study Skills Tips	Note-taking/Organizational Tool	Student Checklist	Binding*
Explorations and Notes (Schulz) Note-taking guide designed to help students stay focused and to provide a framework for further exploration.	X	X	X			X	X		X	X	B
Guided Lecture Notes (Sullivan/Sullivan, Sullivan) Lecture notes designed to help students take thorough, organized, and understandable notes as they watch the Author in Action videos.		X	X	X			X		X		LL
Guided Notebook** (Trigsted) Interactive workbook that guides students through the course by asking them to write down key definitions and work through important examples for each section of the eText.	X				X		X		X	X	LL
Learning Guide (Blitzer) This workbook provides additional practice for each section and guidance for test preparation.	X	X	X	X		X		X	X	X	LL
MyNotes (LHSD) Note-taking structure for students to use while they read the textbook or watch the MyMathLab videos.			X				X		X		LL
Note-taking Guide (Harshbarger/Yocco) This workbook provides a framework for students to help them take thorough, organized, and understandable notes for the course.							X		X		LL

*Binding types: B- Bound, LL- Loose Leaf

**The eText Reference for the Trigsted series is another option, and is essentially a printed version of the eText. If someone is looking for a “workbook” type resource, show them the Guided Notebook. If someone wants the full eText in printed format, show the eText Reference. Send the eText Reference for “instructor desk copies”.

***IR Worksheets can be purchased with both an Integrated Review MyMathLab course or a regular MyMathLab course.

Workbook Options	Learning Objectives	Extra Practice Problems	Extra Examples	Side-by-Side Examples and Practice	Video-Based Examples	End of Chapter Review	Vocab Exercises	Study Skills Tips	Note-taking/Organizational Tool	Student Checklist	Binding*
Video Notebook (BPB, BBEP, Dugopolski) Helps students develop organized notes as they work along with the videos.	X	X	X		X						LL
Integrated Review (IR) Worksheets*** (BPB, Blitzler, LHSD, Harshbarger/Yocco, Rockswold, Sullivan, Trigsted) Provide extra practice for every text section, plus multiple methods problems.		X					X	X		X	LL/B

*Binding types: B- Bound, LL- Loose Leaf

**The eText Reference for the Trigsted series is another option, and is essentially a printed version of the eText. If someone is looking for a “workbook” type resource, show them the Guided Notebook. If someone wants the full eText in printed format, show the eText Reference. Send the eText Reference for “instructor desk copies”.

***IR Worksheets can be purchased with both an Integrated Review MyMathLab course or a regular MyMathLab course.



Explorations and Notes

Note-taking Guide designed to help students stay focused and to provide a framework for further exploration.

Includes:

- Learning Objectives
- Extra Practice Problems
- Extra Examples
- End of Chapter Review
- Vocab Exercises
- Note-taking/Organizational Tool
- Student Checklist

Available with the Following Titles:

Schulz © 2014

Precalculus, First Edition ([Sample](#))

Chapter 1 Functions

Explorations & Notes: 1.1 What is a Function?

Definition of a Function

DEFINITION Function, Domain, Range

A is a relation between two sets assigning to each element in the first set exactly element in the second set. The first set is called the of the function, and the second set is called the of the function. The is the variable associated with the domain; the belongs to the range.

EXPLORE Example 1

1. Explain how, with two values of 1 appearing in the second column, Relation 1 is still a function.

EXPLORE Example 2

2. Explain why the price of an airplane ticket is not a function of the length of the flight.

EXPLORE Example 3

3. A plot of the tuition function is shown in Figure 1.2. Explain why the points cannot be connected.

Function Notation

$$\frac{\boxed{}}{\boxed{}} \left(\frac{\boxed{}}{\boxed{}} \right).$$

The of a function is the expression on which the function works.

EXPLORE Example 4

4. Explain why $f(x) + 1$ and $f(x + 1)$ are different (see QUICK CHECK 3).

EXPLORE Example 5

$$\begin{aligned} \frac{f(x+h) - f(x)}{h} &= \frac{\overbrace{\left(\text{input} \right)}^{f(x+h)} - \overbrace{\left(\text{input} \right)}^{f(x)}}{h} \\ &= \frac{\text{input} - \text{input} - \text{input}}{h} \\ &= \frac{\text{input}}{h} \\ &= \frac{h \left(\text{input} \right)}{h} = \text{input} \end{aligned}$$

The Natural Domain of a Function

When a function is given without reference to a specific domain, the of the function is understood to be the set of real numbers for which outputs of the function are real numbers; that is, where the function is .

EXPLORE Example 6

5. Explain why the natural domain of g is not the set of all real numbers.

6. Explain why the natural domain of h is the set of all real numbers.

7. Explain why the natural domain of m is not the set of all real numbers.

Check Your Progress

Upon completing this section, you should

- understand the definition of a function;
- be able to determine whether or not a relation given in words is a function;
- be able to determine whether or not a relation given in numeric form is a function;
- understand and be able to use function notation;
- be able to identify the domain and range of a function.

Guided Lecture Notes

Lecture notes designed to help students take thorough, organized, and understandable notes as they watch the Author in Action videos.

Includes:

- Extra Practice Problems
- Extra Examples
- Side-by-Side Examples and Practice
- Vocab Exercises
- Note-taking/Organizational Tool

Available with the Following Titles:

Sullivan/Sullivan © 2015/17 Series

College Algebra Enhanced with Graphing Utilities, Seventh Edition

Algebra and Trigonometry Enhanced with Graphing Utilities, Seventh Edition

Precalculus enhanced with Graphing Utilities, Seventh Edition ([Sample](#))

College Algebra: Concepts Through Functions, Third Edition

Precalculus: Concepts Through Functions, A Right Triangle Approach to Trigonometry, Third Edition

Precalculus: Concepts Through Functions, A Unit Circle Approach to Trigonometry, Third Edition

Sullivan © 2016 Series

College Algebra, Tenth Edition ([Sample](#))

Trigonometry, Tenth Edition

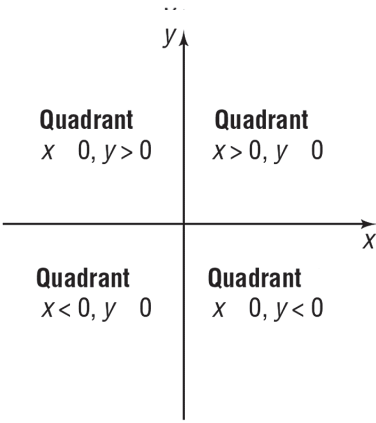
Algebra and Trigonometry, Tenth Edition

Precalculus, Tenth Edition

Chapter 1: Graphs

Section 1.1: The Distance and Midpoint Formulas; Graphing Utilities; Introduction to Graphing Equations

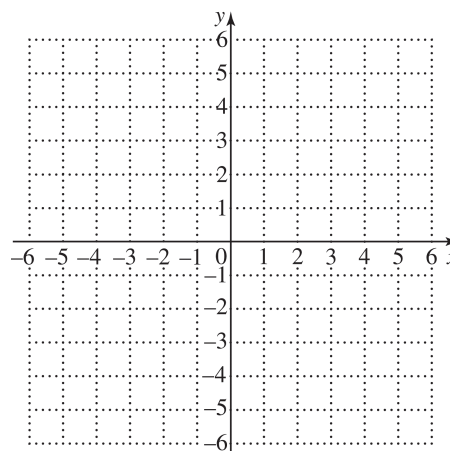
Before the Distance and Midpoint Formulas can be used, some vocabulary should be defined.

<p>Rectangular Coordinates: In a two-dimensional rectangular or _____ coordinate system, a horizontal line is called the _____ - axis and a vertical line is called the _____ - axis. The point of intersection of these axes is called the _____. Points on the coordinate system or plane are located by using an _____ or (x, y). Upon intersection of the horizontal and vertical axes, four _____ are created, as shown. From the origin, moving to the right creates a positive x-coordinate or _____ and moving to the left creates a negative x-coordinate. Likewise, moving up creates a positive y-coordinate or _____ and moving down creates a negative y-coordinate. Fill in the graph to the right with the missing quadrant names and inequalities.</p>	
--	---

Exploration 1*: Use the Distance Formula

Determine the distance between the points $(-3, -5)$ and $(3, 3)$.

1. Plot the points on the following graph:
2. Connect the points with a line segment called d . This segment will be the hypotenuse of a right triangle that is created when a horizontal line is extended through $(-3, -5)$ and a vertical line through $(3, 3)$. The intersection of these two lines is the point _____.
3. The length of the horizontal leg of the right triangle is: _____. How did you find this?
4. The length of the vertical leg of the right triangle is: _____. How did you find this?
5. The hypotenuse, or d can be found using the _____ Theorem and is _____.
6. In general, the distance between the points, d was found by:



2 Chapter 1 Graphs

Distance Formula Theorem: The distance between two points $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$, denoted by $d = (P_1, P_2)$ is: $d = (P_1, P_2) = \sqrt{\quad\quad\quad}$

Example 1*: Use the Distance Formula

Determine the distance between the points $(-6, -6)$ and $(-5, -2)$.

The Midpoint Formula

Midpoint Formula Theorem: The **midpoint** of a line segment is the point located exactly _____ between the two endpoints of the line segment. More specifically, the midpoint $M = (x, y)$ of the line segment from $P_1 = (x_1, y_1)$ to $P_2 = (x_2, y_2)$, is:

$$M = \left(\text{—————}, \text{—————} \right)$$

Example 2*: Use the Midpoint Formula

Find the midpoint of the line segment joining $P_1 = (0, 8)$ and $P_2 = (4, -6)$.

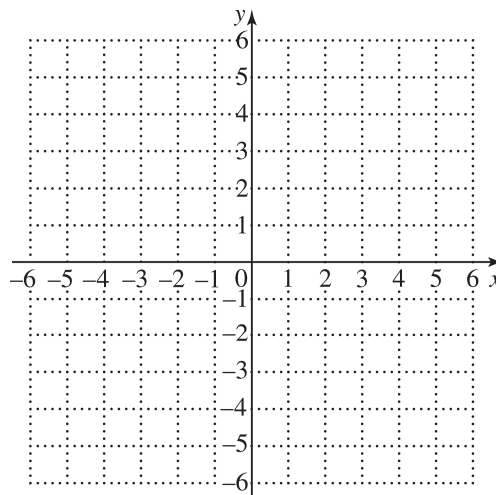
Section 1.1 The Distance and Midpoint Formulas; Graphing Utilities; Introduction to Graphing Equations 3

One of the simplest ways of graphing an equation is to plot points. Values are chosen for one of the variables and the corresponding value of the remaining variable is determined by using the equation. These points are said to satisfy the equation because they produce a true statement.

Example 3*: Graph an Equation Using the Point-Plotting Method

Graph the equation $y = -x + 3$ by completing the following table, plotting the points and connecting the points with a smooth curve called a _____.

x	y	(x, y)
-2	$y = -(-2) + 3 = 5$	$(-2, 5)$
-1		
0		
1		
2		

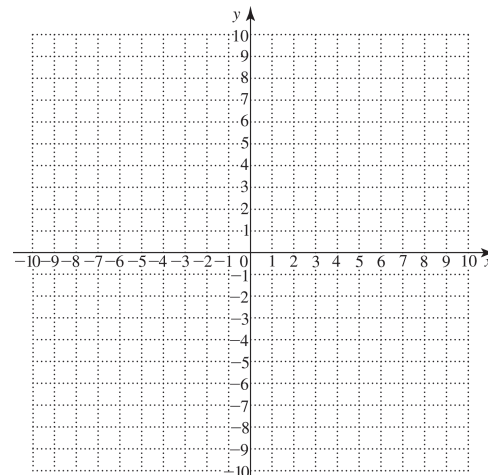


In this example, the number of points was chosen for you. If this weren't true, how would you determine how many points to choose and which points to choose?

Example 4*: Graph an Equation Using the Point-Plotting Method

Graph the equation $y = x^2 + 3$ by completing the following table, plotting the points and connecting the points with a smooth curve called a _____.

x	y	(x, y)
-2	7	$(-2, 7)$
-1		
0		
1		
2		



4 Chapter 1 Graphs

Another way of graphing, is to use a graphing utility. All graphing utilities graph equations by plotting points on a screen. The graphing utility will display the coordinate axes of a rectangular coordinate system. This rectangular coordinate system will need a scale that must be set along with the smallest and largest values of x and y . Doing this is called setting the viewing window and the following values must be given:

X_{\min} : the _____ value of x shown on the viewing window.

X_{\max} : the _____ value of x shown on the viewing window.

X_{scl} : the number of units per _____ mark on the x – axis.

Y_{\min} : the _____ value of y shown on the viewing window.

Y_{\max} : the _____ value of y shown on the viewing window.

Y_{scl} : the number of units per _____ mark on the y – axis.

Exploration 2*: Graph Equations Using Graphing Utility

Graph $2x^2 + y = 12$

- To use your graphing utility, you need to write the equation in the form:
 $y = \{ \text{_____} \}$. This turns the original equation into the equation
 $y = \text{_____}$.
- To graph the equation, first push the _____ button on your graphing utility.
- Now enter the equation, being careful to not confuse the _____ symbol with the _____ symbol.
- Press the Window button, to set your viewing window to a _____ viewing window, which has the following settings:
 X_{\min} : _____ X_{\max} : _____ X_{scl} : _____
 Y_{\min} : _____ Y_{\max} : _____ Y_{scl} : _____

This viewing window can also be achieved by pressing the _____ button, and select _____.
- Adjust the viewing window to show all the _____ features of the graph.

In addition to graphing equations, graphing utilities can also be used to create a table of values to show various points that lie on the graph of an equation.

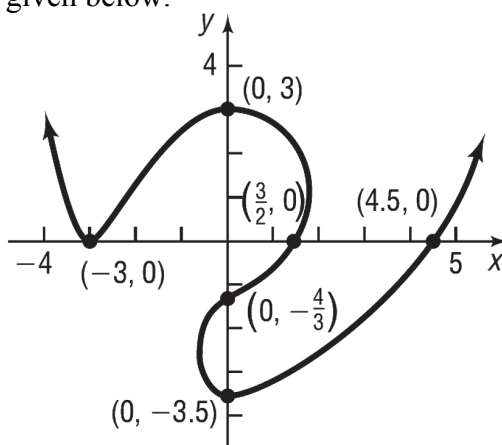
Example 5*: Create a Table Using a Graphing Utility

Create a table of values for the graph of the equation used in Exploration 2.

In Example 3, the graph crossed the x and y axis at the points (____, ____) and (____, ____). In general, a point that crosses or touches the coordinate axes is called an _____. If the point crosses or touches the x -axis, it is called an _____ and if the point crosses or touches the y -axis, it is call a _____.

Example 6*: Identify the Intercepts from the Graph of an Equation

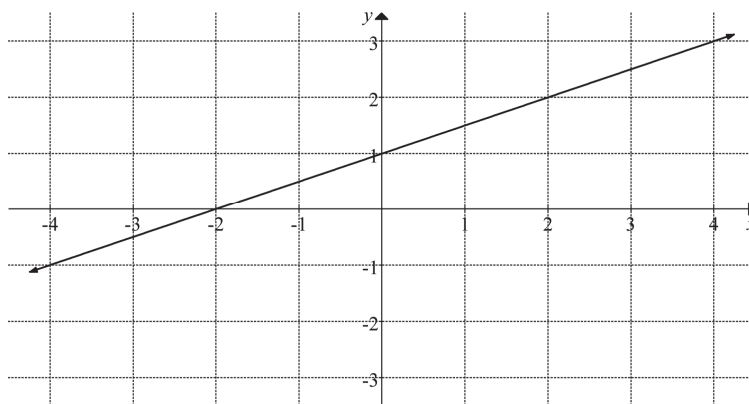
The graph of an equation is given below.



- (a) The intercepts are: (____, ____), (____, ____), (____, ____), (____, ____), (____, ____), (____, ____)
- (b) The x -intercepts are: _____
- (c) The y -intercepts are: _____

Example 7: Find Intercepts from a Graph

The graph of an equation is given below.



6 Chapter 1 Graphs

- (a) The intercepts are: (____, ____) and (____, ____)
- (b) The x -intercept is: _____
- (c) The y -intercept is: _____

If the intercepts aren't clear, a graphing utility can help to approximate the intercepts.

Example 8*: Approximate Intercepts Using a Graphing Utility

Use a graphing utility to approximate the intercepts for the graph of the equation used in Exploration 2. Describe the method you used.

Chapter 1: Equations and Inequalities

Section 1.1: Linear Equations

A **linear equation in one variable** is an equation equivalent in form to _____ where a and b are real numbers and _____.

Why does the definition say $a \neq 0$? What type of equation would it be if $a = 0$?

To solve an equation means to find all the solutions of the equation that make it true. Solutions can be written in set notation, called the **solution set**. One method to solve is to write a series of **equivalent equations**. Multiple properties from previous courses can help with this, including the Addition and Multiplication Properties of Equality along with the Distributive Property.

Example 1*: Solve Linear Equations

Solve the equations:

(a) $6 + y = 11$

(b) $\frac{1}{7}x = 4$

(c) $3a - 9 = -24$

(d) $3a - 8 = 2a - 15$

(e) $12 - 2x - 3(x + 2) = 4x + 12 - x$

(f) $\frac{2}{5} + v = \frac{1}{2} - \frac{3}{10}$

(g) $0.9t - 1.2 = 0.4 + 0.1t$

Sometimes in solving what ends up as a linear equation, does not begin that way.

Example 2: Solve Equations That Lead to Linear Equations

Solve $(x + 2)(x - 4) = (x + 3)^2$ by simplifying first to see the linear equation.

Example 3: Solve Equations That Lead to Linear Equations

Solve $\frac{2x}{x+5} = \frac{-6}{x+5} - 2$ by simplifying first to see the linear equation.

Example 4: Solve Equations That Lead to Linear Equations

Solve $\frac{2x}{x+3} = \frac{-6}{x+3} - 2$ by simplifying first to see the linear equation. Why does the solution to this equation end up being \emptyset ?

Many applied problems require the solution of a quadratic equation. Let's look at one in the next example.

Example 5: Solve Problems That Can Be Modeled by Linear Equations

A total of \$15,000 is to be divided between Jon and Wendy, with Jon to receive \$2500 less than Wendy. How much will each receive?

Step 1: Determine what you are looking for.

Step 2: Assign a variable to represent what you are looking for. If necessary, express any remaining unknown quantities in terms of this variable.

Step 3: Translate the English into mathematical statements. A table can be used to organize the information. Use the information to build your model.

Step 4: Solve the equation and answer the original question.

Step 5: Check your answer with the facts presented in the problem.

Example 6: Solve Problems That Can Be Modeled by Linear Equations

Sierra, who is paid time-and-a-half for hours worked in excess of 40 hours, had gross weekly wages of \$935 for 50 hours worked. Use the steps for solving applied problems to determine her regular hourly rate.

Guided Notebook

Interactive workbook that guides students through the course by asking them to write down key definitions and work through important examples for each section of the text.

Includes:

- Learning Objectives
- Video-Based Examples
- Vocab Exercises
- Note-taking/Organizational Tool
- Student Checklist

Available with the Following Titles:

Trigsted © 2015 Series

College Algebra, Third Edition ([Sample](#))

College Algebra Interactive, First Edition

Trigonometry, Second Edition

Algebra & Trigonometry, Second Edition

Section 1.1

Section 1.1 Guided Notebook

Section 1.1 Linear Equations

- Work through Section 1.1 TTK
- Work through Objective 1
- Work through Objective 2
- Work through Objective 3
- Work through Objective 4
- Work through Objective 5

Section 1.1 Linear Equations

1.1 Things To Know

1. Factoring Trinomials with a Leading Coefficient Equal to 1

Can you factor the polynomial $b^2 - 9b + 14$? Try working through a “You Try It” problem or refer to section R.5 or watch the video.

2. Factoring Trinomials with a Leading Coefficient Not Equal to 1.

Can you factor the polynomial $15x^2 - 17x - 4$? Try working through a “You Try It” problem or refer to section R.5 or watch the video.

Section 1.1 Objective 1 Recognizing Linear Equations

What is the definition of an **algebraic expression**?

What is the definition of a **linear equation in one variable**?

Section 1.1

In the Interactive Video following the definition of a linear equation in one variable, which equation is not linear? Explain why it is not linear.

Section 1.1 Objective 2 Solving Linear Equations with Integer Coefficients

What does the term **integer coefficient** mean?

Work through Example 1 and Example 2 in your eText and take notes here:

Try this one on your own: Solve the following equation: $3 - 4(x + 4) = 6x - 32$ and see if you can get an answer of $x = \frac{19}{10}$. You might want to try a “You Try It” problem now.

Section 1.1 Objective 3 Solving Linear Equations Involving Fractions

What is the definition of a **least common denominator (LCD)**?

What is the first thing to do when solving linear equations involving fractions?

Section 1.1

Work through the video that accompanies Example 3 and write your notes here: Solve

$$\frac{1}{3}(1-x) - \frac{x+1}{2} = -2$$

Try this one on your own: Solve the following equation: $\frac{1}{5}x - \frac{1}{3}(x-4) = \frac{1}{2}(x+1)$ and

see if you can get an answer of $x = \frac{25}{19}$. You might want to try a “You Try It” problem now.

Section 1.1 Objective 4 Solving Linear Equations Involving Decimals

When encountering a linear equation involving decimals, how do you eliminate the decimals?

Work through the video that accompanies Example 4 and write your notes here:

Solve $.1(y - 2) + .03(y - 4) = .02(10)$

Try this one on your own: Solve the following equation: $0.004(9 - k) + 0.04(k - 9) = 1$ and see if you can get an answer of $x = \frac{331}{9}$. You might want to try a “You Try It” problem now.

Section 1.1

Section 1.1 Objective 5 Solving Equations that Lead to Linear Equations

Work through Example 5 and take notes here: Solve $3a^2 - 1 = (a + 1)(3a + 2)$

Work through Example 6 and take notes here: $\frac{2-x}{x+2} + 3 = \frac{4}{x+2}$

What is an **extraneous solution**?

Work through Example 7 and take notes here: Solve $\frac{12}{x^2+x-2} - \frac{x+3}{x-1} = \frac{1-x}{x+2}$
(What do you have to do BEFORE you find the lowest common denominator?)

Try this one on your own: Solve the following equation: $\frac{10}{x^2-2x} - \frac{4}{x} = \frac{4}{x-2}$ and see if you
can get an answer of $x = \frac{9}{4}$. You might want to try a “You Try It” problem now.

Learning Guide

This workbook provides additional practice for each section and guidance for test preparation.

Includes:

- Learning Objectives
- Extra Practice Problems
- Extra Examples
- Side-by-Side Examples and Practice
- End of Chapter Review
- Study Skills Tips
- Note-taking/Organizational Tool
- Student Checklist

Available with the Following Titles:

Blitzer © 2014 Series

College Algebra, Sixth Edition

College Algebra: an Early Functions Approach, Third Edition

College Algebra Essentials, Forth Edition

Trigonometry, Eleventh Edition ([Sample](#))

College Algebra and Trigonometry, Sixth Edition

Precalculus, Sixth Edition

Section 1.1

Angles and Radian Measure

Ever Feel Like You're Just Going in Circles?

You're riding on a Ferris wheel and wonder how fast you are traveling. Before you got on the ride, the operator told you that the wheel completes two full revolutions every minute and that your seat is 25 feet from the center of the wheel. You just rode on the merry-go-round, which made 2.5 complete revolutions per minute. Your wooden horse was 20 feet from the center, but your friend, riding beside you was only 15 feet from the center. Were you and your friend traveling at the same rate?

In this section, we study both angular speed and linear speed and solve problems similar to those just stated.

Objective #1: Recognize and use the vocabulary of angles.

Solved Problem #1

- 1a.** True or false: When an angle is in standard position, its initial side is along the positive y -axis.

False; When an angle is in standard position, its initial side is along the positive x -axis.

- 1b.** Fill in the blank to make a true statement: If the terminal side of an angle in standard position lies on the x -axis or the y -axis, the angle is called a/an _____ angle.

Such an angle is called a quadrantal angle.

Pencil Problem #1

- 1a.** True or false: When an angle is in standard position, its vertex lies in quadrant I.

- 1b.** Fill in the blank to make a true statement: A negative angle is generated by a _____ rotation.

Objective #2: Use degree measure.

Solved Problem #2

- 2.** Fill in the blank to make a true statement: An angle that is formed by $\frac{1}{2}$ of a complete rotation measures _____ degrees and is called a/an _____ angle.

Such an angle measures 180 degrees and is called a straight angle.

Pencil Problem #2

- 2.** Fill in the blank to make a true statement: An angle that is formed by $\frac{1}{4}$ of a complete rotation measures _____ degrees and is called a/an _____ angle.

Objective #3: Use radian measure.
--

<p style="text-align: center;"> Solved Problem #3</p> <p>3. A central angle, θ, in a circle of radius 12 feet intercepts an arc of length 42 feet. What is the radian measure of θ?</p> <p>The radian measure of the central angle, θ, is the length of the intercepted arc, s, divided by the radius of the circle, r: $\theta = \frac{s}{r}$. In this case, $s = 42$ feet and $r = 12$ feet.</p> $\theta = \frac{s}{r} = \frac{42 \text{ feet}}{12 \text{ feet}} = 3.5$ <p>The radian measure of θ is 3.5.</p>	<p style="text-align: center;"> Pencil Problem #3 </p> <p>3. A central angle, θ, in a circle of radius 10 inches intercepts an arc of length 40 inches. What is the radian measure of θ?</p>
---	---

Objective #4: Convert between degrees and radians.

<p style="text-align: center;"> Solved Problem #4</p> <p>4a. Convert 60° to radians. To convert from degrees to radians, multiply by $\frac{\pi \text{ radians}}{180^\circ}$. Then simplify.</p> $60^\circ \cdot \frac{\pi \text{ radians}}{180^\circ} = \frac{60\pi \text{ radians}}{180} = \frac{\pi}{3} \text{ radians}$	<p style="text-align: center;"> Pencil Problem #4 </p> <p>4a. Convert 135° to radians. Express your answer as a multiple of π.</p>
--	--

- | | |
|---|---|
| <p>4b. Convert -300° to radians.</p> $-300^\circ \cdot \frac{\pi \text{ radians}}{180^\circ} = -\frac{300\pi \text{ radians}}{180} = -\frac{5\pi}{3} \text{ radians}$ | <p>4b. Convert -225° to radians. Express your answer as a multiple of π.</p> |
|---|---|

- 4c. Convert $\frac{\pi}{4}$ radians to degrees.

To convert from radians to degrees, multiply by

$\frac{180^\circ}{\pi \text{ radians}}$. Then simplify.

$$\frac{\cancel{\pi}}{4} \text{ radians} \cdot \frac{180^\circ}{\cancel{\pi} \text{ radians}} = \frac{180^\circ}{4} = 45^\circ$$

- 4c. Convert $\frac{\pi}{2}$ radians to degrees.

- 4d. Convert 6 radians to degrees.

$$6 \text{ radians} \cdot \frac{180^\circ}{\pi \text{ radians}} = \frac{1080^\circ}{\pi} \approx 343.8^\circ$$

- 4d. Convert 2 radians to degrees. Round to two decimal places.

Objective #5: Draw angles in standard position.

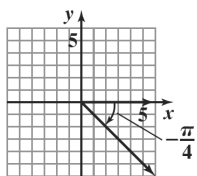
 **Solved Problem #5**

- 5a. Draw the angle $\theta = -\frac{\pi}{4}$ in standard position.

Since the angle is negative, it is obtained by a clockwise rotation. Express the angle as a fractional part of 2π .

$$\left| -\frac{\pi}{4} \right| = \frac{\pi}{4} = \frac{1}{8} \cdot 2\pi$$

The angle $\theta = -\frac{\pi}{4}$ is $\frac{1}{8}$ of a full rotation in the clockwise direction.



 **Pencil Problem #5** 

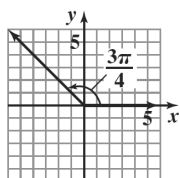
- 5a. Draw the angle $\theta = -\frac{5\pi}{4}$ in standard position.

5b. Draw the angle $\alpha = \frac{3\pi}{4}$ in standard position.

Since the angle is positive, it is obtained by a counterclockwise rotation. Express the angle as a fractional part of 2π .

$$\frac{3\pi}{4} = \frac{3}{8} \cdot 2\pi$$

The angle $\alpha = \frac{3\pi}{4}$ is $\frac{3}{8}$ of a full rotation in the counterclockwise direction.



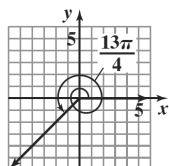
5b. Draw the angle $\alpha = \frac{7\pi}{6}$ in standard position.

5c. Draw the angle $\gamma = \frac{13\pi}{4}$ in standard position.

Since the angle is positive, it is obtained by a counterclockwise rotation. Express the angle as a fractional part of 2π .

$$\frac{13\pi}{4} = \frac{13}{8} \cdot 2\pi$$

The angle $\gamma = \frac{13\pi}{4}$ is $\frac{13}{8}$ or $1\frac{5}{8}$ full rotation in the counterclockwise direction. Complete one full rotation and then $\frac{5}{8}$ of a full rotation.



5c. Draw the angle $\gamma = \frac{16\pi}{3}$ in standard position.

Objective #6: Find coterminal angles.
--

 **Solved Problem #6**

- 6a.** Find a positive angle less than 360° that is coterminal with a 400° angle.

Since 400° is greater than 360° , we subtract 360° .

$$400^\circ - 360^\circ = 40^\circ$$

A 40° angle is positive, less than 360° , and coterminal with a 400° angle.

 **Pencil Problem #6** 

- 6a.** Find a positive angle less than 360° that is coterminal with a 395° angle.

- 6b.** Find a positive angle less than 2π that is coterminal with a $-\frac{\pi}{15}$ angle.

Since $-\frac{\pi}{15}$ is negative, we add 2π .

$$-\frac{\pi}{15} + 2\pi = -\frac{\pi}{15} + \frac{30\pi}{15} = \frac{29\pi}{15}$$

A $\frac{29\pi}{15}$ angle is positive, less than 2π , and coterminal with a $-\frac{\pi}{15}$ angle.

- 6b.** Find a positive angle less than 2π that is coterminal with a $-\frac{\pi}{50}$ angle.

- 6c. Find a positive angle less than 2π that is coterminal with a $\frac{17\pi}{3}$ angle.

Since $\frac{17\pi}{3}$ is greater than 4π , we subtract two multiples of 2π .

$$\frac{17\pi}{3} - 2 \cdot 2\pi = \frac{17\pi}{3} - 4\pi = \frac{17\pi}{3} - \frac{12\pi}{3} = \frac{5\pi}{3}$$

A $\frac{5\pi}{3}$ angle is positive, less than 2π , and coterminal with a $\frac{17\pi}{3}$ angle.

- 6c. Find a positive angle less than 2π that is coterminal with a $-\frac{31\pi}{7}$ angle.

Objective #7: Find the length of a circular arc.

 **Solved Problem #7**

7. A circle has a radius of 6 inches. Find the length of the arc intercepted by a central angle of 45° . Express arc length in terms of π . Then round your answer to two decimal places.

We begin by converting 45° to radians.

$$45^\circ \cdot \frac{\pi \text{ radians}}{180^\circ} = \frac{45\pi \text{ radians}}{180} = \frac{\pi}{4} \text{ radians}$$

Now we use the arc length formula $s = r\theta$ with the radius $r = 6$ inches and the angle $\theta = \frac{\pi}{4}$ radians.

$$s = r\theta = (6 \text{ in.}) \left(\frac{\pi}{4} \right) = \frac{6\pi}{4} \text{ in.} = \frac{3\pi}{2} \text{ in.} \approx 4.71 \text{ in.}$$

 **Pencil Problem #7** 

7. A circle has a radius of 8 feet. Find the length of the arc intercepted by a central angle of 225° . Express arc length in terms of π . Then round your answer to two decimal places.

Objective #8: Find the area of a sector.

 **Solved Problem #8**

8. A circle has a radius of 6 feet. Find the area of the sector formed by a central angle of 150° . Express the area in terms of π . Then round your answers to two decimal places.

To use the formula $A = \frac{1}{2}r^2\theta$, θ must be expressed in radians, so we convert 150° to radians.

$$150^\circ = 150^\circ \cdot \frac{\pi \text{ radians}}{180^\circ} = \frac{150\pi}{180} \text{ radians} = \frac{5\pi}{6} \text{ radians}$$

Now we use the formula with $r = 6$ feet and

$$\theta = \frac{5\pi}{6} \text{ radians.}$$

$$\begin{aligned} A &= \frac{1}{2}r^2\theta = \frac{1}{2}(6)^2\left(\frac{5\pi}{6}\right) \\ &= 15\pi \approx 47.12 \text{ square feet} \end{aligned}$$

The area of the sector is approximately 47.12 square feet.

 **Pencil Problem #8**

8. A circle has a radius of 10 meters. Find the area of the sector formed by a central angle of 18° . Express the area in terms of π . Then round your answers to two decimal places.

Objective #9: Use linear and angular speed to describe motion on a circular path.

 **Solved Problem #9**

9. A 45-rpm record has an angular speed of 45 revolutions per minute. Find the linear speed, in inches per minute, at the point where the needle is 1.5 inches from the record's center.

We are given the angular speed in revolutions per minute: $\omega = 45$ revolutions per minute. We must express ω in radians per minute.

$$\begin{aligned} \omega &= \frac{45 \cancel{\text{revolutions}}}{1 \text{ minute}} \cdot \frac{2\pi \text{ radians}}{1 \cancel{\text{revolution}}} \\ &= \frac{90\pi \text{ radians}}{1 \text{ minute}} \text{ or } \frac{90\pi}{1 \text{ minute}} \end{aligned}$$

Now we use the formula $v = r\omega$.

$$v = r\omega = 1.5 \text{ in.} \cdot \frac{90\pi}{1 \text{ min}} = \frac{135\pi \text{ in.}}{\text{min}} \approx 424 \text{ in./min}$$

 **Pencil Problem #9**

9. A Ferris wheel has a radius of 25 feet. The wheel is rotating at two revolutions per minute. Find the linear speed, in feet per minute, of a seat on this Ferris wheel.

Answers for Pencil Problems (*Textbook Exercise references in parentheses*):

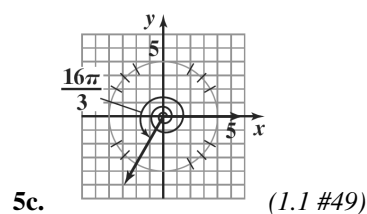
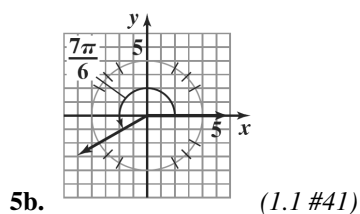
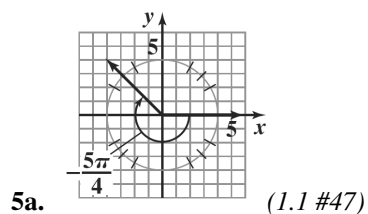
1a. False **1b.** clockwise

2. 90; right

3. 4 radians (*1.1 #7*)

4a. $\frac{3\pi}{4}$ radians (*1.1 #15*) **4b.** $-\frac{5\pi}{4}$ radians (*1.1 #19*) **4c.** 90° (*1.1 #21*)

4d. 114.59° (*1.1 #35*)



6a. 35° (*1.1 #57*) **6b.** $\frac{99\pi}{50}$ (*1.1 #67*) **6c.** $\frac{11\pi}{7}$ (*1.1 #69*)

7. 10π ft \approx 31.42 ft (*1.1 #73*)

8. $5\pi \approx 15.71$ sq m (*1.1 #75*)

9. 100π ft/min \approx 314 ft/min (*1.1 #106*)



MyNotes

Note-taking structure for students to use while they read the textbook or watch the MyMathLab videos.

Includes:

- Extra Examples
- Vocab Exercises
- Note-taking/Organizational Tool

Available with the Following Titles:

Lial/Hornsby/Schneider/Daniels © 2015/17 Series

College Algebra, Twelfth Edition ([Sample](#))

Essentials of College Algebra, Eleventh Edition

Trigonometry, Eleventh Edition

College Algebra and Trigonometry, Sixth Edition

Precalculus, Sixth Edition

Chapter 1 Equations and Inequalities

1.1 Linear Equations

- Basic Terminology of Equations ■ Linear Equations
- Identities, Conditional Equations, and Contradictions
- Solving for a Specified Variable (Literal Equations)

Key Terms: equation, solution (root), solution set, equivalent equations, linear equation in one variable, first-degree equation, identity, conditional equation, contradiction, literal equation, simple interest, future value (maturity value)

Basic Terminology of Equations

A number that makes an equation a true statement is called a _____ of the equation.

The set of all numbers that satisfy an equation is called the _____ of the equation.

Equations with the same solution set are _____.

Addition and Multiplication Properties of Equality

Let a , b , and c represent real numbers.

$$\text{If } a = b, \text{ then } a + c = b + c.$$

That is, the same number may be added to each side of an equation without changing the solution set.

$$\text{If } a = b \text{ and } c \neq 0, \text{ then } ac = bc.$$

That is, each side of an equation may be multiplied by the same nonzero number without changing the solution set. (Multiplying each side by zero leads to $0 = 0$.)

Linear Equations

Linear Equation in One Variable

A **linear equation in one variable** is an equation that can be written in the form

$$ax + b = 0,$$

where a and b are real numbers with $a \neq 0$.

EXAMPLE 1 Solving a Linear Equation

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

EXAMPLE 2 Solving a Linear Equation with Fractions

Solve $\frac{2x + 4}{3} + \frac{1}{2}x = \frac{1}{4}x - \frac{7}{3}$.

Identities, Conditional Equations, and Contradictions**EXAMPLE 3 Identifying Types of Equations**

Determine whether each equation is an *identity*, a *conditional equation*, or a *contradiction*. Give the solution set.

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

(b) $5x - 4 = 11$

(c) $3(3x - 1) = 9x + 7$

Identifying Types of Linear Equations

1. If solving a linear equation leads to a true statement such as $0 = 0$, the equation is an _____. Its solution set is _____. (See Example 3(a).)
2. If solving a linear equation leads to a single solution such as $x = 3$, the equation is _____. Its solution set consists of _____. (See Example 3(b).)
3. If solving a linear equation leads to a false statement such as $-3 = 7$, the equation is a _____. Its solution set is _____. (See Example 3(c).)

Solving for a Specified Variable (Literal Equations)

EXAMPLE 4 Solving for a Specified Variable

Solve each formula or equation for the specified variable.

(a) $I = Prt$, for t

(b) $A - P = Prt$, for P

(c) $3(2x - 5a) + 4b = 4x - 2$, for x

Reflect: How is solving a literal equation for a specified variable similar to solving an equation? How is solving a literal equation for a specified variable different from solving an equation?

EXAMPLE 5 Applying the Simple Interest Formula

A woman borrowed \$5240 for new furniture. She will pay it off in 11 months at an annual simple interest rate of 4.5%. How much interest will she pay?



Note-taking Guide

This workbook provides a framework for students to help them take thorough, organized, and understandable notes for the course.

Includes:

- Vocab Exercises
- Note-taking/Organizational Tool

Available with the Following Titles:

Harshbarger/Yocco © 2017

College Algebra in Context for the Managerial, Life, and Social Sciences, Fifth Edition ([Sample](#))

Chapter 1 Functions, Graphs, and Models; Linear Functions

Section 1.1 Functions and Models

Data: Real-world information collected in numerical form

Function: A rule or correspondence that assigns to each element of a set (called the domain) exactly one element of a second set (called the range)

Ways to define a function: A function may be defined by a set of ordered pairs, a diagram, a table, a graph, an equation, or a verbal description

Domain: The set of all first elements of the function, or the inputs

Independent variable: The variable representing elements in the domain

Range: The set of all second elements of the function, or the outputs

Dependent variable: The variable representing elements in the range

Scatter plot: A graph of ordered pairs, usually real-life data

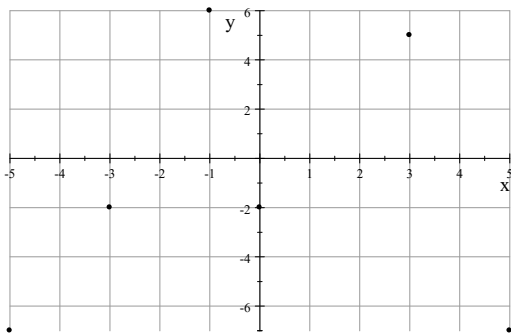
EXAMPLE 1 *Body Temperature*

Suppose a child's normal temperature is 98.6°F and the only thermometer available, which is Celsius, indicates that the child's temperature is 37°C . If the function that relates Fahrenheit and Celsius temperatures is $F = \frac{9}{5}C + 32$, does this reading indicate that the child's temperature is normal?

EXAMPLE 2 *Domains and Ranges*

For each of the following graphs of functions, find the domain and range.

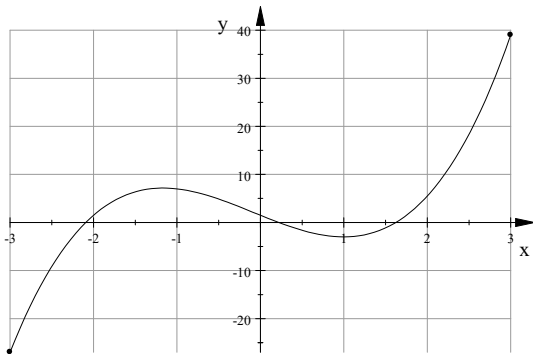
a.



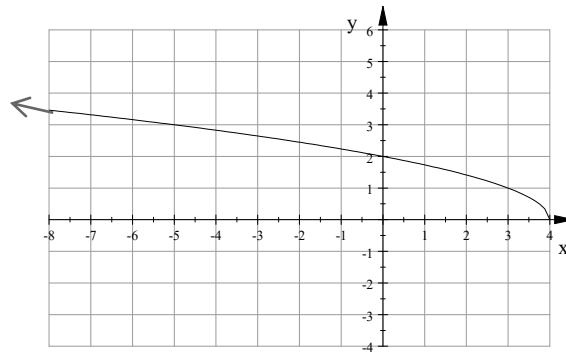
x	y
-5	-7
-3	-2
-1	6
0	-2
3	5
5	-7

2 Chapter 1 Functions, Graphs, and Models; Linear Functions

b.



c.



EXAMPLE 3 Recognizing Functions

For each of the following, determine whether or not the indicated relationship represents a function. Explain your reasoning. For each function that is defined, give the domain and range.

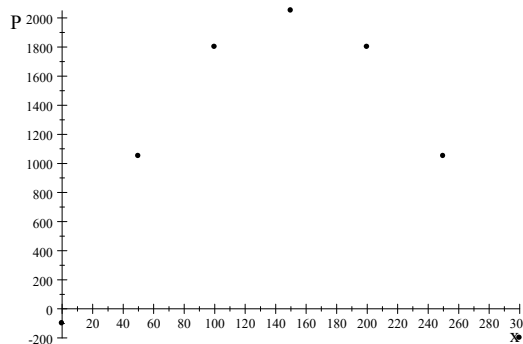
a. The PC industry celebrated its 35th year anniversary in 2010. The sales S of personal computers in the U.S., in millions of dollars, by year x , are shown in the table. Is S a function of x ?

Year, x	U.S. Sales of Personal Computers, S (\$ millions)
1975	0.04
1980	0.76
1985	6.6
1990	9.5
1995	21.4
2000	46.0
2005	62.0
2010	83.8
2015	122

(Source: eTForecasts)

b. The daily profit P (in dollars) from the sale of x pounds of candy as shown in the scatter plot. Is P a function of x ?

x	P
0	-100
50	1050
100	1800
150	2050
200	1800
250	1050
300	-200



- c. The number of tons x of coal sold determined by the profit P that is made from the sale of the product, as shown in the table below. Is x a function of P ?

x (tons)	0	500	1000	1500	2000	2500	3000
P (\$)	-100,000	109,000	480,000	505,000	480,000	109,000	-100,000

- d. A is the amount in a person's checking account on a given day.

EXAMPLE 4 Functions

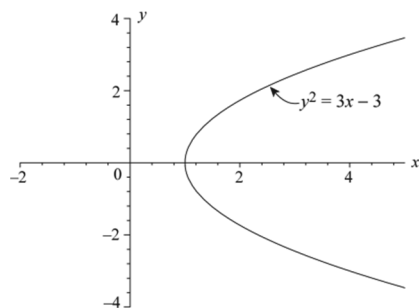
- a. Does the equation $y^2 = 3x - 3$ define y as a function of x ?

- b. Does the equation $y = -x^2 + 4x$ define y as a function of x ?

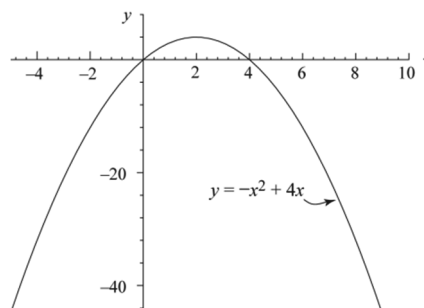
Vertical Line Test A set of points in a coordinate plane is the graph of a function if and only if no vertical line intersects the graph in more than one point.

Determine whether the following graphs are graphs of functions. If not, explain why not.

a.



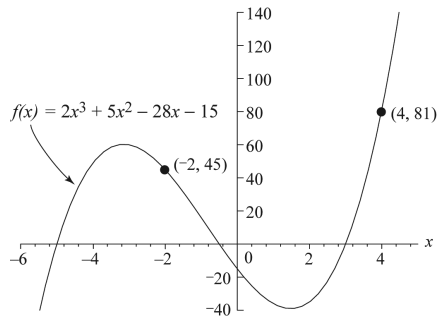
b.



Function notation: We use the notation $y = f(x)$ to denote that y is a function of x . For specific values of x , $f(x)$ represents the resulting outputs, or y -values. In particular, the point $(a, f(a))$ lies on the graph of $y = f(x)$ for any number a in the domain of the function. We can also say that $f(a)$ is $f(x)$ evaluated at a .

EXAMPLE 5 *Function Notation*

The figure shows the graph of $f(x) = 2x^3 + 5x^2 - 28x - 15$.

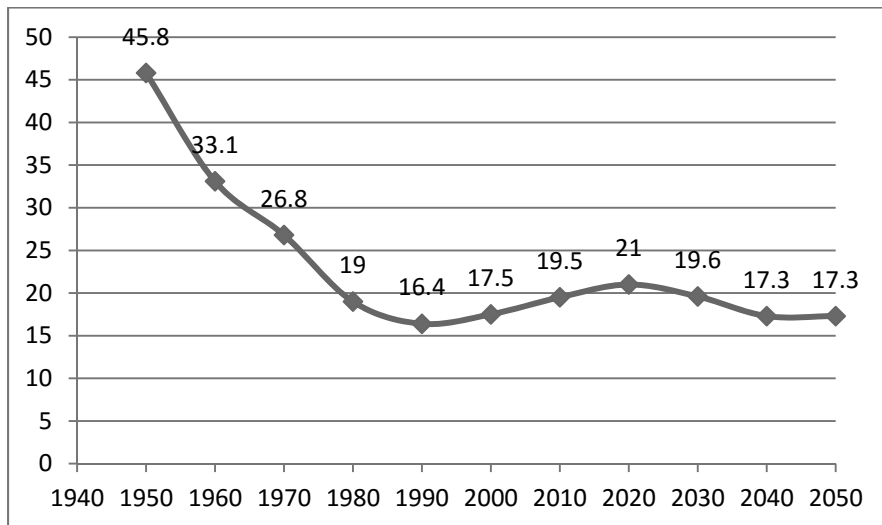


a. Use the points shown on the graph to find $f(-2)$ and $f(4)$.

b. Use the equation to find $f(-2)$ and $f(4)$.

EXAMPLE 6 *Elderly Men in the Workforce*

The points on the graph in the figure give the number of elderly men in the workforce (in millions) as a function g of the year for selected years t from 1950 and projected to 2050.



(Source: U.S. Department of Labor)

a. Find and interpret $g(2020)$.

b. What is the input t if the output is $g(t) = 19.6$ million men?

- c. What can be said about the number of elderly men in the workforce during 2020 – 2040?
- d. What is the maximum number of elderly men in the workforce during the period shown on the graph?

Modeling

The process of translating real-world information into a mathematical form so that it can be applied and then interpreted in the real-world setting is called **modeling**. As we most often use it in this text, a **mathematical model** is a functional relationship (usually in the form of an equation) that includes not only the function rule but also includes descriptions of all involved variables and their units of measure.

Aligning Data

When finding a model to fit a set of data, it is often easier to use aligned inputs rather than the actual data values. **Aligned inputs** are simply input values that have been converted to smaller numbers by subtracting the same number from each input. For instance, instead of using t as the actual year in the following example, it is more convenient to use an aligned input that is the number of years after 1990.

EXAMPLE 7 Public Health Care Expenditures

Public health care expenditures for the period 1990-2012 can be modeled (that is, accurately approximated) by the function $E(t) = 738.1(1.065)^t$, where $E(t)$ is in billions of dollars and t is the number of years after 1990. (Source: U.S. Department of Health and Human Services)

- a. What are the independent and dependent variables?
- b. What value of t represents 2010?
- c. Approximate the public health care expenditure for 2010.
- d. Use the model to estimate the public health care expenditure for 2015. Can we be sure about this estimate?

Video Notebook

Helps students develop organized notes as they work along with the videos.

Includes:

- Learning Objectives
- Extra Practice Problems
- Extra Examples
- Video-Based Examples

Available with the Following Titles:

Beecher/Penna/Bittinger © 2016 Series

College Algebra, Fifth Edition ([Sample](#))

Algebra and Trigonometry, Fifth Edition

Precalculus, Fifth Edition

Bittinger/Beecher/Ellenbogen/Penna © 2017 Series

College Algebra: Graphs and Models, Sixth Edition ([Sample](#))

Algebra and Trigonometry: Graphs and Models, Sixth Edition

Precalculus: Graphs and Models, Sixth Edition

Dugopolski © 2015/17 Series

College Algebra, Sixth Edition

Trigonometry, Forth Edition ([Sample](#))

College Algebra and Trigonometry, Sixth Edition

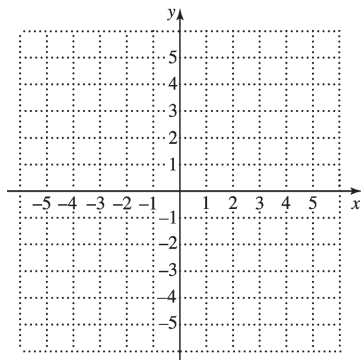
Precalculus: Functions and Graphs, MyMathLab Update,
Forth Edition

Section 1.1 Introduction to Graphing

Plotting Points, (x, y) , in a Plane

Each point (x, y) in the plane is described by an **ordered pair**. The first number, x , indicates the point's horizontal location with respect to the y -axis, and the second number, y , indicates the point's vertical location with respect to the x -axis. We call x the **first coordinate**, the **x -coordinate**, or the **abscissa**. We call y the **second coordinate**, the **y -coordinate**, or the **ordinate**.

Example 1 Graph and label the points $(-3, 5)$, $(4, 3)$, $(3, 4)$, $(-4, -2)$, $(3, -4)$, $(0, 4)$, $(-3, 0)$, and $(0, 0)$.



Example 2 Determine whether each ordered pair is a solution of the equation $2x + 3y = 18$.

a) $(-5, 7)$

$$\begin{array}{r} 2x + 3y = 18 \\ \hline 2(\boxed{}) + 3(\boxed{}) \stackrel{?}{=} 18 \\ -10 + 21 \\ \boxed{} \quad | \quad 18 \quad \underline{\hspace{2cm}} \\ \text{True / False} \end{array}$$

$(-5, 7)$ a solution.
is / is not

b) $(3, 4)$

$$\begin{array}{r} 2x + 3y = 18 \\ \hline 2(\boxed{}) + 3(\boxed{}) \stackrel{?}{=} 18 \\ 6 + 12 \\ \boxed{} \quad | \quad 18 \quad \underline{\hspace{2cm}} \\ \text{True / False} \end{array}$$

$(3, 4)$ a solution.
is / is not

x- and y-Intercepts

An **x-intercept** is a point $(a, 0)$. To find a , let $y = 0$ and solve for x .

A **y-intercept** is a point $(0, b)$. To find b , let $x = 0$ and solve for y .

Example 3 Graph: $2x + 3y = 18$.

Find the y-intercept: $(0, \square)$

$$2 \cdot \square + 3y = 18$$

$$0 + 3y = 18$$

$$3y = 18$$

$$y = \square$$

Find the x-intercept: $(\square, 0)$

$$2x + 3 \cdot \square = 18$$

$$2x + 0 = 18$$

$$2x = 18$$

$$x = \square$$

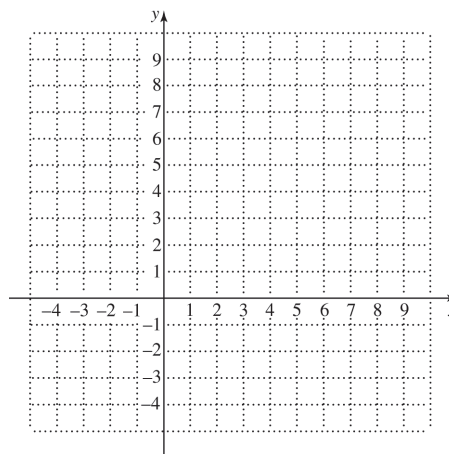
Find a third point: $(5, \square)$

$$2 \cdot \square + 3y = 18$$

$$10 + 3y = 18$$

$$3y = \square$$

$$y = \square$$



Example 4 Graph: $3x - 5y = -10$.

$$3y - 5y = -10$$

$$-5y = \square - 10$$

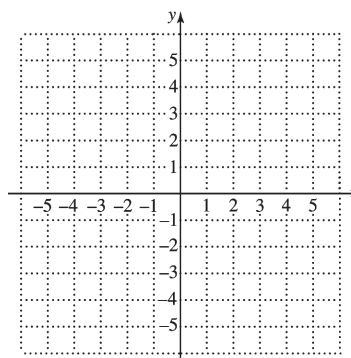
$$y = \frac{3}{5}x + \square$$

When $x = -5$, $y = \frac{3}{5}(\square) + 2 = -3 + 2 = \square$.

When $x = 0$, $y = \frac{3}{5} \cdot \square + 2 = 0 + 2 = \square$.

When $x = 5$, $\frac{3}{5} \cdot \square + 2 = 3 + 2 = \square$.

x	y	(x, y)
-5	-1	$(-5, -1)$
0	\square	$(0, \square)$
5	5	$(5, 5)$



Example 5 Graph: $y = x^2 - 9x - 12$.

$$x = -3:$$

$$y = (\square)^2 - 9(\square) - 12$$

$$= 9 + \square - 12 = 24$$

$$(-3, \square)$$

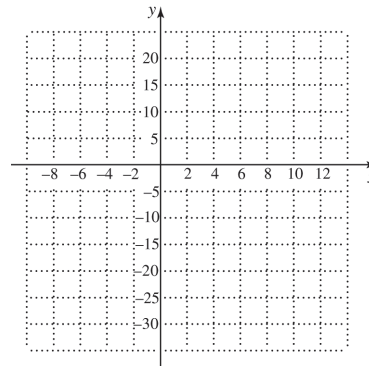
x	y	(x, y)
-3	24	$(-3, 24)$
-1	-2	$(-1, -2)$
0	-12	$(0, -12)$
2	-26	$(2, -26)$
4	-32	$(4, -32)$
5	-32	$(5, -32)$
10	-2	$(10, -2)$
12	24	$(12, 24)$

$$x = 2:$$

$$y = \square^2 - 9 \cdot \square - 12$$

$$= \square - 18 - 12 = -26$$

$$(2, \square)$$



The Distance Formula

The **distance** d between any two points (x_1, y_1) and (x_2, y_2) is given by

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

Example 6 Find the distance between each pair of points.

a) $(-2, 2)$ and $(3, -6)$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{[3 - (\square)]^2 + (\square - 2)^2}$$

$$= \sqrt{\square^2 + (-8)^2}$$

$$= \sqrt{25 + 64}$$

$$= \sqrt{\square} \approx \square$$

b) $(-1, -5)$ and $(-1, 2)$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{[-1 - (\square)]^2 + (-5 - \square)^2}$$

$$= \sqrt{0^2 + (\square)^2}$$

$$= \sqrt{\square} = \square$$

4 Section 1.1 Introduction to Graphing

Example 7 The point $(-2, 5)$ is on a circle that has $(3, -1)$ as its center. Find the length of the radius of the circle.

$$\begin{aligned}
 d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\
 d &= \sqrt{(-2 - \boxed{})^2 + (5 - (\boxed{}))^2} \\
 &= \sqrt{(-5)^2 + \boxed{}^2} \\
 &= \sqrt{\boxed{} + 36} \\
 &= \sqrt{61} \approx 7.8
 \end{aligned}$$

The Midpoint Formula

If the endpoints of a segment are (x_1, y_1) and (x_2, y_2) , then the coordinates of the **midpoint** of the segment are

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Example 8 Find the midpoint of the segment whose endpoints are $(-4, -2)$ and $(2, 5)$.

$$\begin{aligned}
 &\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\
 &\left(\frac{-4 + \boxed{}}{2}, \frac{\boxed{} + 5}{2} \right) \\
 &= \left(\frac{-2}{2}, \frac{3}{2} \right) \\
 &= \left(\boxed{}, \frac{3}{2} \right)
 \end{aligned}$$

Example 9 The diameter of a circle connects the points $(2, -3)$ and $(6, 4)$ on the circle. Find the coordinates of the center of the circle.

$$\begin{aligned}
 &\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\
 &\left(\frac{2 + \boxed{}}{2}, \frac{\boxed{} + 4}{2} \right) \\
 &= \left(\boxed{}, \frac{1}{2} \right)
 \end{aligned}$$

The Equation of a Circle

The standard form of the equation of a circle with center (h, k) and radius r is

$$(x-h)^2 + (y-k)^2 = r^2.$$

Example 10 Find an equation of the circle having radius 5 and center $(3, -7)$.

$$(x-h)^2 + (y-k)^2 = r^2$$

$$h = 3 \quad k = \boxed{} \quad r = 5$$

$$(x-3)^2 + [y - (\boxed{})]^2 = 5^2$$

$$(x-3)^2 + (y + \boxed{})^2 = \boxed{}$$

Example 11 Graph the circle $(x+5)^2 + (y-2)^2 = 16$.

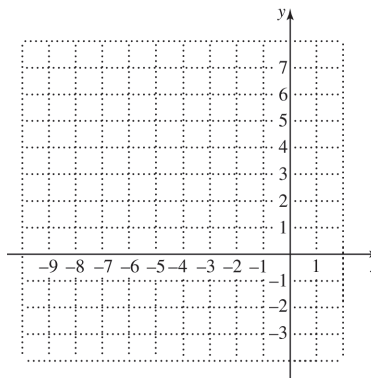
$$(x-h)^2 + (y-k)^2 = r^2$$

(h, k) center, r radius

$$[x - (\boxed{})]^2 + (y - 2)^2 = \boxed{}^2$$

Center: $(-5, \boxed{})$

Radius: $\boxed{}$

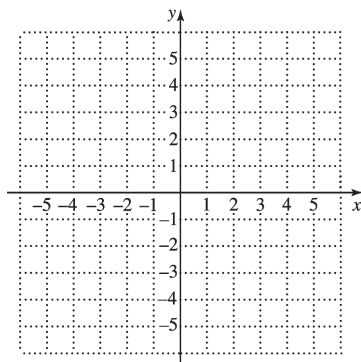


Section 1.1 Introduction to Graphing

Plotting Points, (x, y) , in a Plane

Each point (x, y) in the plane is described by an **ordered pair**. The first number, x , indicates the point's horizontal location with respect to the y -axis, and the second number, y , indicates the point's vertical location with respect to the x -axis. We call x the **first coordinate**, the **x -coordinate**, or the **abscissa**. We call y the **second coordinate**, the **y -coordinate**, or the **ordinate**.

Example 1 Graph and label the points $(-3, 5)$, $(4, 3)$, $(3, 4)$, $(-4, -2)$, $(3, -4)$, $(0, 4)$, $(-3, 0)$, and $(0, 0)$.



Example 2 Determine whether each ordered pair is a solution of the equation $2x + 3y = 18$.

a) $(-5, 7)$

$$\begin{array}{r} 2x + 3y = 18 \\ \hline 2(\boxed{}) + 3(\boxed{}) \stackrel{?}{=} 18 \\ -10 + 21 \\ \boxed{} \quad | \quad 18 \quad \underline{\hspace{2cm}} \\ \text{True / False} \end{array}$$

$(-5, 7)$ a solution.
is / is not

b) $(3, 4)$

$$\begin{array}{r} 2x + 3y = 18 \\ \hline 2(\boxed{}) + 3(\boxed{}) \stackrel{?}{=} 18 \\ 6 + 12 \\ \boxed{} \quad | \quad 18 \quad \underline{\hspace{2cm}} \\ \text{True / False} \end{array}$$

$(3, 4)$ a solution.
is / is not

x- and y-Intercepts

An **x-intercept** is a point $(a, 0)$. To find a , let $y = 0$ and solve for x .

A **y-intercept** is a point $(0, b)$. To find b , let $x = 0$ and solve for y .

Example 3 Graph: $2x + 3y = 18$.

Find the y-intercept: $(0, \square)$

$$2 \cdot \square + 3y = 18$$

$$0 + 3y = 18$$

$$3y = 18$$

$$y = \square$$

Find the x-intercept: $(\square, 0)$

$$2x + 3 \cdot \square = 18$$

$$2x + 0 = 18$$

$$2x = 18$$

$$x = \square$$

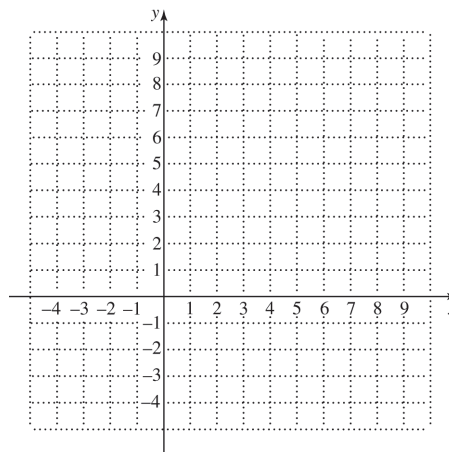
Find a third point: $(5, \square)$

$$2 \cdot \square + 3y = 18$$

$$10 + 3y = 18$$

$$3y = \square$$

$$y = \square$$



Example 4 Graph: $3x - 5y = -10$.

$$3x - 5y = -10$$

$$-5y = \square - 10$$

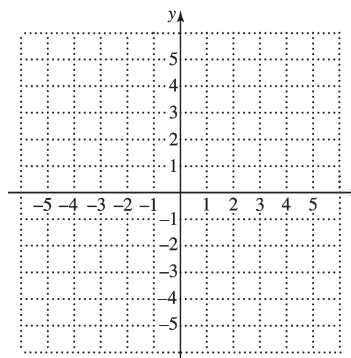
$$y = \frac{3}{5}x + \square$$

When $x = -5$, $y = \frac{3}{5}(\square) + 2 = -3 + 2 = \square$.

When $x = 0$, $y = \frac{3}{5} \cdot \square + 2 = 0 + 2 = \square$.

When $x = 5$, $\frac{3}{5} \cdot \square + 2 = 3 + 2 = \square$.

x	y	(x, y)
-5	-1	$(-5, -1)$
0	\square	$(0, \square)$
5	5	$(5, 5)$



Example 5 Graph: $y = x^2 - 9x - 12$.

Let $x = -3$:

$$y = (\square)^2 - 9(\square) - 12$$

$$= 9 + \square - 12 = 24$$

$(-3, \square)$

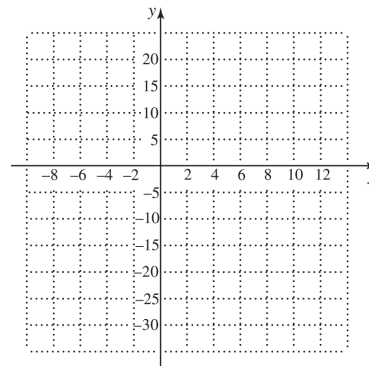
x	y	(x, y)
-3	24	$(-3, 24)$
-1	-2	$(-1, -2)$
0	-12	$(0, -12)$
2	-26	$(2, -26)$
4	-32	$(4, -32)$
5	-32	$(5, -32)$
10	-2	$(10, -2)$
12	24	$(12, 24)$

Let $x = 2$:

$$y = \square^2 - 9 \cdot \square - 12$$

$$= \square - 18 - 12 = -26$$

$(2, \square)$



The Distance Formula

The **distance** d between any two points (x_1, y_1) and (x_2, y_2) is given by

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

Example 6 Find the distance between each pair of points.

a) $(-2, 2)$ and $(3, -6)$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{[3 - (\square)]^2 + (\square - 2)^2}$$

$$= \sqrt{\square^2 + (-8)^2}$$

$$= \sqrt{25 + 64}$$

$$= \sqrt{\square} \approx \square$$

b) $(-1, -5)$ and $(-1, 2)$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{[-1 - (\square)]^2 + (-5 - \square)^2}$$

$$= \sqrt{0^2 + (\square)^2}$$

$$= \sqrt{\square} = \square$$

4 Section 1.1 Introduction to Graphing

Example 7 The point $(-2, 5)$ is on a circle that has $(3, -1)$ as its center. Find the length of the radius of the circle.

$$\begin{aligned}
 d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\
 d &= \sqrt{(-2 - \boxed{})^2 + (5 - (\boxed{}))^2} \\
 &= \sqrt{(-5)^2 + \boxed{}^2} \\
 &= \sqrt{\boxed{} + 36} \\
 &= \sqrt{61} \approx 7.8
 \end{aligned}$$

The Midpoint Formula

If the endpoints of a segment are (x_1, y_1) and (x_2, y_2) , then the coordinates of the **midpoint** of the segment are

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Example 8 Find the midpoint of the segment whose endpoints are $(-4, -2)$ and $(2, 5)$.

$$\begin{aligned}
 &\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\
 &= \left(\frac{-4 + \boxed{}}{2}, \frac{\boxed{} + 5}{2} \right) \\
 &= \left(\frac{-2}{2}, \frac{3}{2} \right) \\
 &= \left(\boxed{}, \frac{3}{2} \right)
 \end{aligned}$$

Example 9 The diameter of a circle connects the points $(2, -3)$ and $(6, 4)$ on the circle. Find the coordinates of the center of the circle.

$$\begin{aligned}
 &\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\
 &= \left(\frac{2 + \boxed{}}{2}, \frac{\boxed{} + 4}{2} \right) \\
 &= \left(\boxed{}, \frac{1}{2} \right)
 \end{aligned}$$

The Equation of a Circle

The standard form of the equation of a circle with center (h, k) and radius r is

$$(x-h)^2 + (y-k)^2 = r^2.$$

Example 10 Find an equation of the circle having radius 5 and center $(3, -7)$.

$$(x-h)^2 + (y-k)^2 = r^2$$

$$h = 3 \quad k = \boxed{} \quad r = 5$$

$$(x-3)^2 + [y - (\boxed{})]^2 = 5^2$$

$$(x-3)^2 + (y + \boxed{})^2 = \boxed{}$$

Example 11 Graph the circle $(x+5)^2 + (y-2)^2 = 16$.

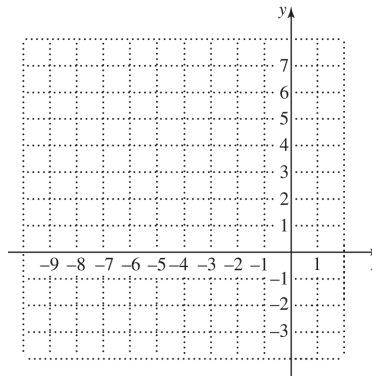
$$(x-h)^2 + (y-k)^2 = r^2$$

(h, k) center, r radius

$$[x - (\boxed{})]^2 + (y - 2)^2 = \boxed{}^2$$

Center: $(-5, \boxed{})$

Radius: $\boxed{}$



When we graph a circle using a graphing calculator, we select a viewing window in which the distance between the units is visually the same on both axes. This is called **squaring the viewing window**. On many calculators we can do this by choosing a window in which the length of the y -axis is $\frac{2}{3}$ the length of the x -axis with $Xscl = Yscl$. The window with dimensions $[-6, 6, -4, 4]$, $[-9, 9, -6, 6]$, and $[-12, 12, -8, 8]$ are examples of squared windows.

6 Section 1.1 Introduction to Graphing

Example 12 Graph the circle $(x-2)^2 + (y+1)^2 = 16$.

We will graph this circle on a graphing calculator using the Circle feature from the DRAW menu. To do this we need to know the center and the radius of the circle.

$$(x-h)^2 + (y-k)^2 = r^2$$

$$(x - \boxed{})^2 + [y - (-1)]^2 = \boxed{}^2$$

Center (h, k) : $(2, \boxed{})$

Radius r : 4

Press $\boxed{2^{\text{nd}}}$ $\boxed{\text{PRGM}}$ to see the DRAW menu. Then use the $\boxed{\nabla}$ key to move to item 9, Circle.

Press $\boxed{\text{ENTER}}$ or $\boxed{9}$ to copy "Circle(" to the home screen. Now enter the coordinates of the center followed by the radius by pressing $\boxed{2}$ $\boxed{,}$ $\boxed{}$ $\boxed{,}$ $\boxed{4}$ $\boxed{)}$. Choose a squared window.

One good choice is $[-9, 9, -6, 6]$. Press $\boxed{\text{ENTER}}$ to see the graph.

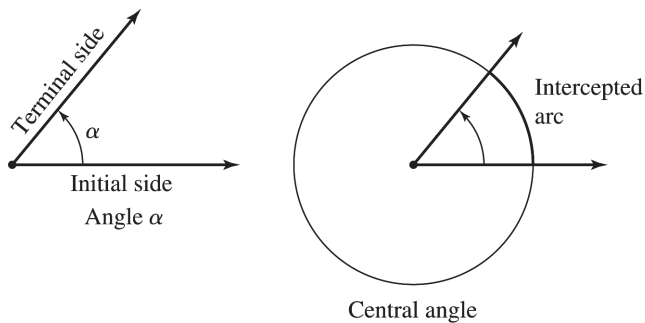
Section 1.1 – Angles and Degree Measure

Angles

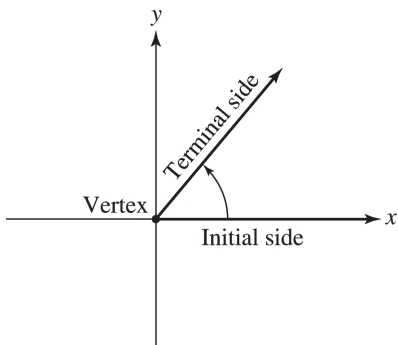
Draw a picture of an example of Ray \overrightarrow{AB} :

Draw a picture of an example of Angle $\angle CAB$:

Initial Side, Terminal Side, Central Angle, and Intercepted Arc



Angle in Standard Position



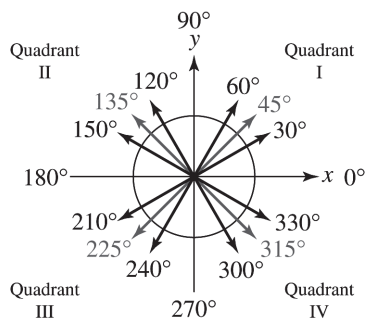
Angle in standard position

Copyright © 2015 Pearson Education, Inc.

Degree Measure of Angles

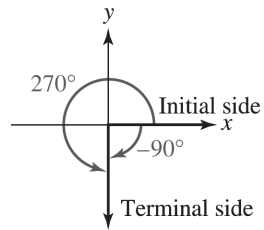
Definition – Degree Measure

A degree measure of an angle is



Draw an example of each of the following:

Acute Angle	Obtuse Angle
Straight Angle	Right Angle

Negative Angles**Definition – Coterminal Angles**

Angles α and β in standard position are coterminal if and only if

Example – Find two positive angles and two negative angles that are coterminal with -50° .

Solution: $310^\circ, 670^\circ, -410^\circ, -770^\circ$

Definition – Quadrantal Angles

A quadrantal angle is an angle with one of the following measures:

24 Chapter 1 Angles and the Trigonometric Functions

Example – Name the quadrant in which each angle lies.

- a. 230°
- b. -580°
- c. 1380°

Solution: a. Quadrant III; b. Quadrant II; c. Quadrant IV

Minutes and Seconds

Important Concept – Minutes and Seconds

The conversion factors for minutes and seconds are as follows:

$$\begin{aligned}1 \text{ degree} &= 60 \text{ minutes} \\1 \text{ minute} &= 60 \text{ seconds} \\1 \text{ degree} &= 3600 \text{ seconds}\end{aligned}$$

Example – Convert the measure $44^\circ 12' 30''$ to decimal degrees. Round to four places.

Solution: 44.2083°

Example – Convert the measure 44.235° to degrees-minutes-seconds format.

Solution: $44^{\circ}14'6''$

Example – Perform the indicated operations. Express answers in degree-minutes-seconds format.

a. $13^{\circ}45'33'' + 9^{\circ}33'39''$

b. $45^{\circ} - 6^{\circ}45'30''$

c. $(21^{\circ}27'36'') / 2$

Solution: a. $23^{\circ}19'12''$; b. $38^{\circ}14'30''$; c. $10^{\circ}43'48''$

Integrated Review (IR) Worksheets

Provide extra practice for every text section, plus multiple methods problems.

Includes:

- Extra Practice Problems
- Vocab Exercises
- Study Skills Tips
- Student Checklist

Available with the Following Titles:

Beecher/Penna/Bittinger © 2016 Series

College Algebra with Integrated Review, Fifth Edition

Blitzer © 2015 Series

College Algebra with Integrated Review, First Edition

Harshbarger/Yocco © 2017

College Algebra in Context with Integrated Review, Fifth Edition

Lial/Hornsby/Schneider/Daniels © 2015/17 Series

Essentials of College Algebra with Integrated Review, First Edition

College Algebra, Twelfth Edition

Rockswold © 2016 Series

College Algebra with Integrated Review, First Edition

[\(Sample\)](#)

Sullivan © 2016 Series

College Algebra with Integrated Review, Tenth Edition

Trigsted © 2015 Series

College Algebra with Integrated Review, First Edition

Name: _____ **Course/Section:** _____ **Instructor:** _____

1.R.1 Use properties of integer exponents.

Review of Exponents ~ The Product Rule ~ The Power Rule ~ The Power of a Product Rule

STUDY PLAN

Read: Read the assigned section in your worktext or eText.

Practice: Do your assigned exercises in your Book MyMathLab Worksheets

Review: Keep your corrected assignments in an organized notebook and use them to review for the test.

Key Terms

Exercises 1-5: Use the vocabulary terms listed below to complete each statement.

Note that some terms or expressions may not be used.

exponent

power rule for exponents

exponential notation

base

product rule for exponents

power of a product rule for exponents

1. The _____ states that for any real number base a and natural number exponents m and n , $(a^m)^n = a^{m \cdot n}$.
2. A mathematical concept called _____ is used to indicate repeated multiplication.
3. The _____ states that for any real number base a and natural number exponents m and n , $a^m \cdot a^n = a^{m+n}$.
4. The exponential expression 3^4 has _____ 3 and _____ 4.
5. The _____ states that for any real numbers a and b and natural number exponent n , $(ab)^n = a^n b^n$.

Review of Exponents

Write each exponential expression as repeated multiplication.

1. $(-5)^2$ 1. _____

2. y^5 2. _____

3. $(-6x)^4$ 3. _____

4. -7^3 4. _____

The Product Rule

Multiply.

5. $x^3 \cdot x^5$ 5. _____

6. $y^6 \cdot y$ 6. _____

NAME:

INSTRUCTOR:

3

7. $a^3 \cdot a^4 \cdot a^4$

7. _____

8. $3w^4 \cdot 7w^3$

8. _____

9. $6x^3 \cdot (-8x^2)$

9. _____

10. $-3t^2 \cdot t^3 \cdot (-5t^5)$

10. _____

The Power Rule

Simplify.

11. $(z^3)^4$

11. _____

12. $(x^2)^4 \cdot (x^3)^3$

12. _____

The Power of a Product Rule*Simplify.*

13. $(3b)^4$ 13. _____

14. $(x^3y)^2$ 14. _____

15. $(6x^5y^3)^2$ 15. _____

16. $(-3a^3b^4)^3$ 16. _____

17. $(3st^2)^3(4s^4t)^2$ 17. _____

Key Terms

Exercises 1-7: Use the vocabulary terms listed below to complete each statement.

Note that some terms or expressions may not be used.

base
undefined
exponent
reciprocal

negative integer exponents
quotient rule for exponents
zero power rule

- The rule for _____ states that $a^{-n} = \frac{1}{a^n}$.
- The exponential expression 2^{-5} has _____ 2 and _____ -5 .
- The _____ states that for any nonzero real number base a , $a^0 = 1$.
- The expression 0^0 is _____.
- The _____ states that for any nonzero real number base a and integer exponents m and n , $\frac{a^m}{a^n} = a^{m-n}$.
- a^{-n} is the _____ of a^n .

The Quotient Rule

Divide. Assume that all variables represent nonzero numbers.

- $\frac{5^9}{5^6}$ 1. _____
- $\frac{y^7}{y^3}$ 2. _____
- $\frac{28x^6}{7x}$ 3. _____

The Zero Power Rule

Simplify each expression. Assume that all variables represent nonzero numbers.

4. 9^0 4. _____

5. $(-4)^0$ 5. _____

6. -5^0 6. _____

7. $7x^0$ 7. _____

Negative Exponents

Simplify each expression using the definition of negative integer exponents. Assume that all variables represent nonzero numbers.

8. 3^{-4} 8. _____

9. x^{-1} 9. _____

10. $2y^{-6}$ 10. _____