

Section 3.4

The Slope-Intercept Form of the Equation of a Line

FIRE and ICE!

Water freezes at 0° Celsius or at 32° Fahrenheit.
Water boils at 100° Celsius or at 212° Fahrenheit.

In this section, you will learn how to use this information to write a linear equation to express the relationship between Celsius temperature and Fahrenheit temperature.

First Steps:

- Take comprehensive notes** from your instructor's lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 3.4 of your textbook which begins on page 244.
- Complete the *Concept and Vocabulary Check* on page 251 of the textbook.

Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

Objective #1: Find a line's slope and y-intercept from its equation.	
<p style="text-align: center;">✓ Solved Problem #1</p> <p>1a. Find the slope and the y-intercept of the line: $y = \frac{2}{3}x + 4$</p> <p>The slope is the x-coefficient, which is $m = \frac{2}{3}$.</p> <p>The y-intercept is the constant term, which is 4.</p>	<p style="text-align: center;"> Pencil Problem #1 </p> <p>1a. Find the slope and the y-intercept of the line: $y = -\frac{1}{2}x + 5$</p>
<p>1b. Find the slope and the y-intercept of the line: $7x + y = 6$</p> <p>First, solve the equation for y. $7x + y = 6 \rightarrow y = -7x + 6$</p> <p>The slope is the x-coefficient, which is $m = -7$.</p> <p>The y-intercept is the constant term, which is 6.</p>	<p>1b. Find the slope and the y-intercept of the line: $3x + 2y = 3$</p>

Objective #2: Graph lines in slope-intercept form.

✓ Solved Problem #2

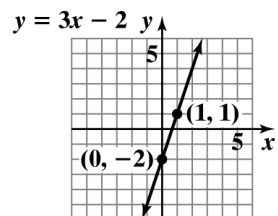
2a. Graph: $y = 3x - 2$

The y-intercept is -2 , so plot the point $(0, -2)$.

The slope is $m = 3$ or $m = \frac{3}{1}$.

Find another point by going up 3 units and to the right 1 unit.

Use a straightedge to draw a line through the two points.



✎ Pencil Problem #2 ✎

2a. Graph: $y = 2x + 4$

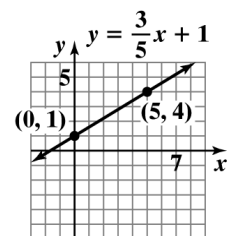
2b. Graph: $y = \frac{3}{5}x + 1$

The y-intercept is 1, so plot the point $(0, 1)$.

The slope is $m = \frac{3}{5}$.

Find another point by going up 3 units and to the right 5 units.

Use a straightedge to draw a line through the two points.



2b. Graph: $y = -\frac{3}{4}x + 2$

Objective #3: Use slope and y-intercept to graph $Ax + By = C$.

✓ Solved Problem #3

3. Graph $3x + 4y = 0$ by using slope and y-intercept.

Solve for y: $3x + 4y = 0$

$$4y = -3x$$

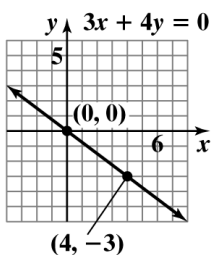
$$y = -\frac{3}{4}x$$

The y-intercept is 0, so plot the point (0,0).

The slope is $m = -\frac{3}{4}$.

Find another point by going down 3 units and to the right 4 units.

Use a straightedge to draw a line through the two points.



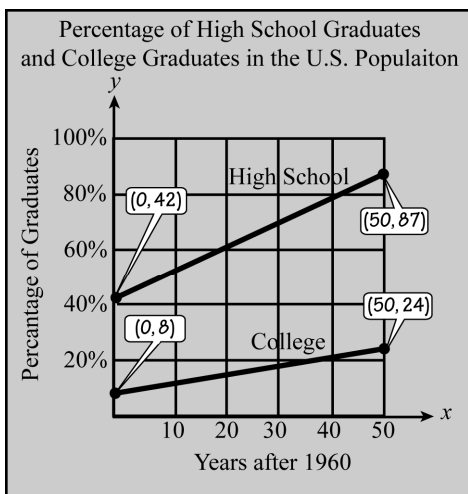
✎ Pencil Problem #3 ✎

3. Graph $7x + 2y = 14$ by using slope and y-intercept.

Objective #4: Use slope and y-intercept to model data.

✓ Solved Problem #4

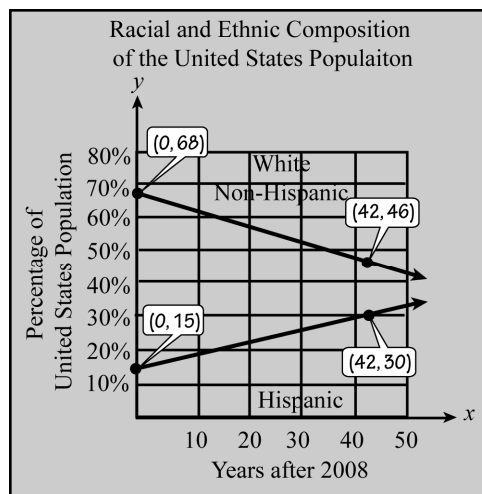
4. The figure shows the percentage of the U.S. population who had graduated from high school and from college in 1960 and 2010.



Source: James M. Henskin, *Essentials of Sociology*, Ninth Edition, Pearson, 2011.

✎ Pencil Problem #4 ✎

4. The figure shows the racial and ethnic composition of the United States population in 2008, with projections for 2050.



Source: Urban Institute

4a. Use the two points for college in the figure to find an equation in the form $y = mx + b$ that models the percentage of college graduates in the U.S. population, y , x years after 1960.

The y -intercept is 8 and the slope is

$$m = \frac{\text{Change in } y}{\text{Change in } x} = \frac{24 - 8}{50 - 0} = \frac{16}{50} = 0.32$$

The equation is $y = 0.32x + 8$.

4b. Use the model from part (a) to project the percentage of college graduates in 2020.

$$\begin{aligned} y &= 0.32x + 8 \\ &= 0.32(60) + 8 \\ &= 27.2 \end{aligned}$$

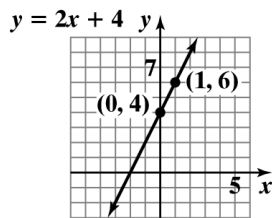
The model projects that 27.2% of the U.S. population will be college graduates in 2020.

4a. Use the two points for white non-Hispanics to find an equation in the form $y = mx + b$ that models the percentage of white non-Hispanics, y , in the United States population x years after 2008. Round m to two decimal places.

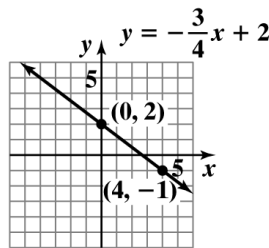
4b. Use the model from part (a) to project the percentage of white non-Hispanics in the United States in 2108.

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

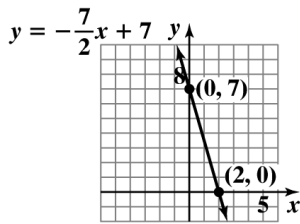
1a. $m = -\frac{1}{2}$ and the y -intercept is 5 (3.4 #5) **1b.** $m = -\frac{3}{2}$ and the y -intercept is $\frac{3}{2}$ (3.4 #23)



2a. (3.4 #27)



2b. (3.4 #35)



3. (3.4 #45)

4a. $y = -0.52x + 68$ (3.4 #65a) **4b.** 16% (3.4 #65b)

Homework:

- Review the Section 3.4 summary on page 273 of the textbook.
- Insert your homework into this section of the Learning Guide. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through MyMathLab, you should still write out your work.