Name _____ Date _____

Equations of Parallel and Perpendicular Lines
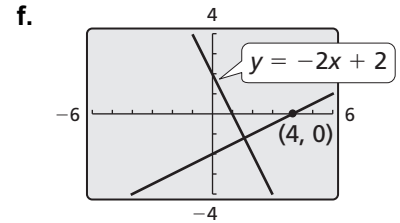**For use with Exploration 3.5**

Essential Question   How can you write an equation of a line that is parallel or perpendicular to a given line and passes through a given point?
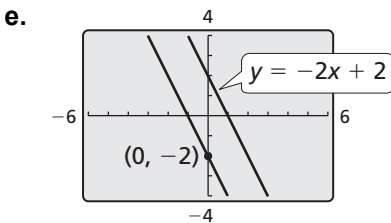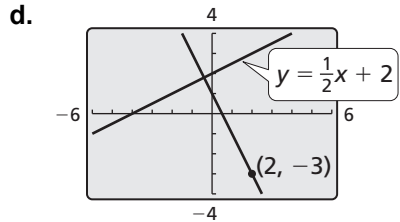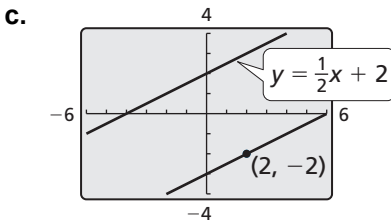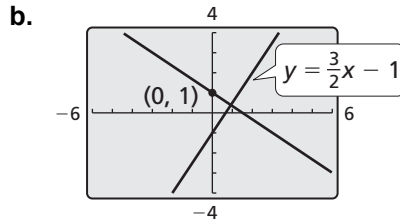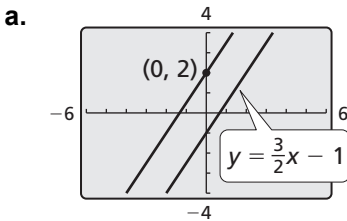
> **1** **EXPLORATION:** Writing Equations of Parallel and Perpendicular Lines

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Write an equation of the line that is parallel or perpendicular to the given line and passes through the given point. Use a graphing calculator to verify your answer. What is the relationship between the slopes?

a.

$(0, 2)$

$y = \frac{3}{2}x - 1$

b.

$y = \frac{3}{2}x - 1$

$(0, 1)$

c.

$y = \frac{1}{2}x + 2$

$(2, -2)$

d.

$y = \frac{1}{2}x + 2$

$(2, -3)$

e.

$y = -2x + 2$

$(0, -2)$

f.

$y = -2x + 2$

$(4, 0)$

3.5 **Equations of Parallel and Perpendicular Lines** (continued)

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2 **EXPLORATION:** Writing Equations of Parallel and Perpendicular Lines

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Write the equations of the parallel or perpendicular lines. Use a graphing calculator to verify your answers.

a.

b.
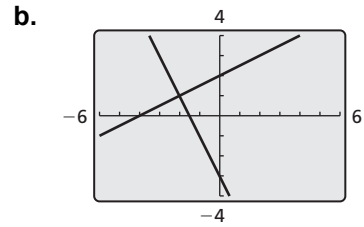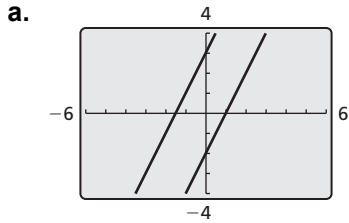
Communicate Your Answer

3. How can you write an equation of a line that is parallel or perpendicular to a given line and passes through a given point?

4. Write an equation of the line that is (a) parallel and (b) perpendicular to the line $y = 3x + 2$ and passes through the point $(1, -2)$.

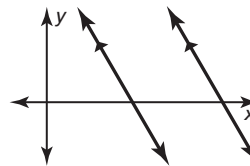## 3.5 Notetaking with Vocabulary
For use after Lesson 3.5

In your own words, write the meaning of each vocabulary term.

directed line segment

Theorems

Theorem 3.13   Slopes of Parallel Lines

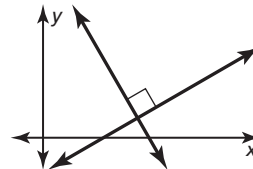In a coordinate plane, two nonvertical lines are parallel if and only if they have the same slope.

Any two vertical lines are parallel.

Notes:

$$m_1 = m_2$$

Theorem 3.14   Slopes of Perpendicular Lines

In a coordinate plane, two nonvertical lines are perpendicular if and only if the product of their slopes is -1.

Horizontal lines are perpendicular to vertical lines.
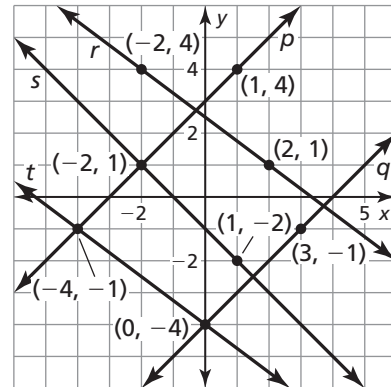
Notes:

$$m_1 \bullet m_2 = -1$$

3.5 **Notetaking with Vocabulary** (continued)

Extra Practice

In Exercises 1 and 2, find the coordinates of point *P* along the directed line segment *AB* so that *AP* to *PB* is the given ratio.

  1. $A(-2, 7)$, $B(-4, 1)$; 3 to 1

  2. $A(3, 1)$, $B(8, -2)$; 2 to 3

  3. Determine which of the lines are parallel and which of the lines are perpendicular.
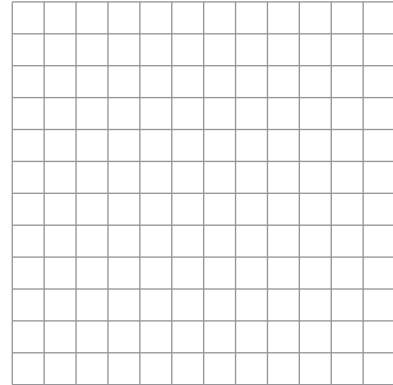

  4. Tell whether the lines through the given points are *parallel*, *perpendicular*, or *neither*. Justify your answer.

  Line 1: $(2, 0)$, $(-2, 2)$

  Line 2: $(1, -2)$, $(4, 4)$

3.5   **Notetaking with Vocabulary (continued)**

5. Write an equation of the line passing through point $P(3, -2)$ that is parallel to $y = \dfrac{2}{3}x - 1$. Graph the equations of the lines to check that they are parallel.

6. Write an equation of the line passing through point $P(-2, 2)$ that is perpendicular to $y = 2x + 3$. Graph the equations of the lines to check that they are perpendicular.
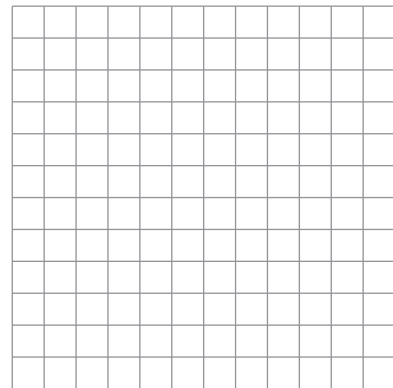
7. Find the distance from point $A(0, 5)$ to $y = -3x - 5$.