

# Families of Linear Graphs (Pages 316–321)

Graphs that have at least one characteristic in common are called a **family of graphs**. Families of linear graphs often have the same slope or the same  $x$ - or  $y$ -intercept. A **parent graph** is the simplest of the graphs in a family. You can change a graph by changing the slope or an intercept. Changes to the parent graph in  $m$  or  $b$  in  $y = mx + b$  are summarized below.

<b>Parent: <math>y = x</math></b>	As the value of $m$ increases, the line gets steeper.
<b>Parent: <math>y = -x</math></b>	As the value of $m$ decreases, the line gets steeper.
<b>Parent: <math>y = 2x</math></b>	As the value of $b$ increases, the graph shifts up on the $y$ -axis. As the value of $b$ decreases, the graph shifts down on the $y$ -axis.

## EXAMPLE

Compare and contrast the graphs of  $y = 2x - 5$  and  $y = 2x + 2$ .

*The graphs have the same slope of 2, but the  $y$ -intercepts are different.*

*Since the value of  $b$  increases from  $-5$  to  $2$ , the graph of  $y = 2x + 2$  is the graph of  $y = 2x - 5$  shifted up 7 units on the  $y$ -axis.*

## PRACTICE

**Graph each pair of equations. Describe any similarities or differences.**

**Explain why they are a family of graphs.**

1.  $y = x - 1$   
 $y = 3x - 1$

2.  $y = 4x$   
 $y = -4x$

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

**Compare and contrast the graphs of each pair of equations. Verify by graphing the equations.**

4.  $y = -\frac{1}{3}x + 5$   
 $y = -\frac{1}{3}x + 4$

5.  $y = 3x - 6$   
 $y = 3x + 6$

6.  $y = -x + 2$   
 $y = x + 2$

**Change  $y = -2x + 1$  so that the graph of the new equation fits each description.**

- same slope, shifted up 2 units
- less steep negative slope, same  $y$ -intercept
- positive slope, same  $y$ -intercept



**10. Standardized Test Practice** Which of the following graphs has the same  $y$ -intercept as  $y = 5x + 1$  and a steeper slope?

**A**  $y = -5x + 1$

**B**  $y = 4x + 1$

**C**  $y = 6x + 1$

**D**  $y = 5x + 2$

**Answers: 1–3.** See Answer Key for graphs. **1.** same  $y$ -intercept, different slopes **2.** same  $y$ -intercept, different slopes **3.** same slope, different  $y$ -intercepts **4.** same slope, different  $y$ -intercepts **5.** same slope, different  $y$ -intercepts **6.** same  $y$ -intercept, different slopes **7.**  $y = -2x + 3$  **8.** Sample answer:  $y = -x + 1$  **9.** Sample answer:  $y = 2x + 1$  **10. C**