

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.

Parent: $y = x$	As the value of m increases, the line gets steeper.
Parent: $y = -x$	As the value of m decreases, the line gets steeper.
Parent: $y = 2x$	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**