Graphing Calculator

A Follow-Up of Lesson 5-3

Sharp EL-9600c

Families of Linear Graphs

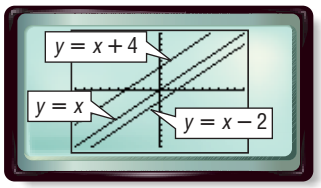
A family of people is a group of people related by birth, marriage, or adoption. Recall that a *family of graphs* includes graphs and equations of graphs that have at least one characteristic in common.

Families of linear graphs fall into two categories—those with the same slope and those with the same y-intercept. A graphing calculator is a useful tool for studying a group of graphs to determine whether they form a family.

Example 1

Graph $y = x$, $y = x + 4$, and $y = x - 2$ in the standard viewing window. Describe any similarities and differences among the graphs. Write a description of the family.

Enter the equations in the Y= list as Y1, Y2, and Y3. Then graph the equations.



[−10, 10] scl: 1 by [−10, 10] scl: 1

KEYSTROKES: *Review graphing on pages 224 and 225.*

- The graph of $y = x$ has a slope of 1 and a y-intercept of 0.
- The graph of $y = x + 4$ has a slope of 1 and a y-intercept of 4.
- The graph of $y = x - 2$ has a slope of 1 and a y-intercept of -2.

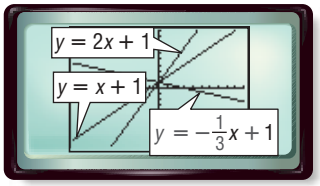
Notice that the graph of $y = x + 4$ is the same as the graph of $y = x$, moved 4 units up. Also, the graph of $y = x - 2$ is the same as the graph of $y = x$, moved 2 units down. All graphs have the same slope and different intercepts.

Because they all have the same slope, this family of graphs can be described as linear graphs with a slope of 1.

Example 2

Graph $y = x + 1$, $y = 2x + 1$, and $y = -\frac{1}{3}x + 1$ in the standard viewing window. Describe any similarities and differences among the graphs. Write a description of the family.

Enter the equations in the Y= list and graph.



[−10, 10] scl: 1 by [−10, 10] scl: 1

- The graph of $y = x + 1$ has a slope of 1 and a y-intercept of 1.

www.algebra1.com/other_calculator_keystrokes

Investigation

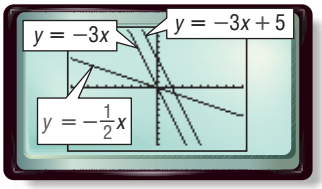
- The graph of $y = 2x + 1$ has a slope of 2 and a y-intercept of 1.
- The graph of $y = -\frac{1}{3}x + 1$ has a slope of $-\frac{1}{3}$ and a y-intercept of 1.

These graphs have the same intercept and different slopes. This family of graphs can be described as linear graphs with a y-intercept of 1.

Sometimes a common characteristic is not enough to determine that a group of equations describes a family of graphs.

Example 3

Graph $y = -3x$, $y = -3x + 5$, and $y = -\frac{1}{2}x$ in the standard viewing window. Describe any similarities and differences among the graphs.



[−10, 10] scl: 1 by [−10, 10] scl: 1

- The graph of $y = -3x$ has slope -3 and y-intercept 0.
- The graph of $y = -3x + 5$ has slope -3 and y-intercept 5.
- The graph of $y = -\frac{1}{2}x$ has slope $-\frac{1}{2}$ and y-intercept 0.

These equations are similar in that they all have negative slope. However since the slopes are different and the y-intercepts are different, these graphs are not all in the same family.

Exercises

Graph each set of equations on the same screen. Describe any similarities or differences among the graphs. If the graphs are part of the same family, describe the family. 1–6. See pp. 315A–315B.

1. $y = -4$
$y = 0$
$y = 7$

2. $y = -x + 1$
$y = 2x + 1$
$y = \frac{1}{4}x + 1$

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

4. $y = \frac{1}{2}x + 2$
$y = \frac{1}{3}x + 3$
$y = \frac{1}{4}x + 4$

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

6. $y = 3x$
$y = 3x + 6$
$y = 3x - 7$

7. MAKE A CONJECTURE Write a paragraph explaining how the values of m and b in the slope-intercept form affect the graph of the equation. See margin.

8. Families of graphs are also called **classes of functions**. Describe the similarities and differences in the class of functions $f(x) = x + c$, where c is any real number.

9. Graph $y = |x|$. Make a conjecture about the transformations of the parent graph, $y = |x| + c$ and, $y = |x + c|$. Use a graphing calculator with different values of c to test your conjecture. See margin.

8. This class of functions has graphs that are lines with slope 1. Their y-intercepts are all different.