

Key Concepts

Lesson
11

Graphing Technology: Parent and Family Graphs

Objective Use a graphing calculator to explore how changing the values of m and b affect the graph of $y = mx + b$.

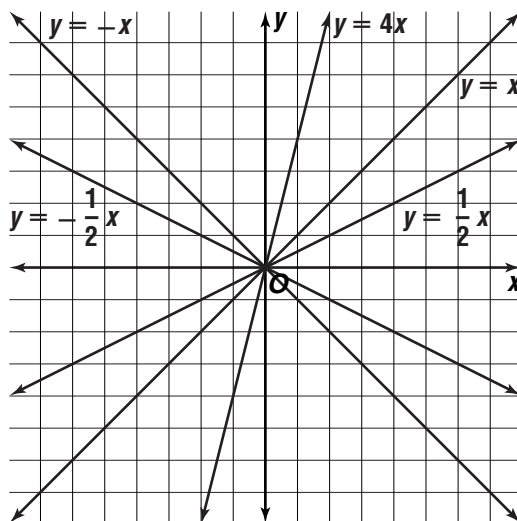
Note to the Teacher *In this lesson, students are asked to explore the graphs of linear equations, and how they depend on the slope and the y-intercept.*

There are several main ideas that this lesson reinforces.

Key Ideas

- Lines with positive slope have the property that as we move to the right along the line, the line slopes upward.
- Lines with negative slope slope downward.
- Lines with zero slope are horizontal.
- Lines with greater positive slope move upward more steeply. Lines with lesser negative slope move downward more steeply.

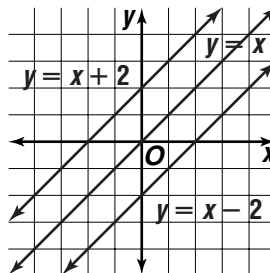
Ask students to explore both positive and negative values of m by graphing equations of the form $y = mx$. Emphasize the key ideas above when discussing the results of the exploration. The collection of lines obtained in this way can be thought of as a **family** of lines. A family of lines is shown below.



Any one of the lines in the family can be thought of as a **parent**, since the other members of the family are obtained by rotating that line. Typically a simple member, such as $y = x$, is the parent graph.

Key Idea	<p>In graphing an equation of the form $y = mx + b$,</p> <ul style="list-style-type: none"> • the line shifts up as the value of b increases, and • the line shifts down as the value of b decreases.
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Ask students to explore by graphing equations of the form $y = x + b$ for various values of b , both positive and negative. Emphasize the key idea above, that the lines are simply a family of parallel lines that move up or down. Again, a simple member, such as $y = x$, is the parent graph. A family of graphs is shown below.



Next, have students explore two different families of lines, $y = 2x + b$ and $y = -x + b$, for various values of b . They will again find families of parallel lines, with slopes 2 and -1 , respectively. Ask the class, “What can you say about lines having the same slope?” **They are parallel.**

Note to the Teacher *The relationship between parallelism and slope will be discussed more in Lesson 6-6, but it is good to introduce the idea now, so that students will more readily understand it later.*

Finally, work a little bit with the absolute value function. Have students graph equations of the form $y = |x|$, $y = |x| + 2$, and $y = |x + 2|$. Ask students how they can get the graphs of the latter two equations from the graph of the first equation. **The graph of $y = |x| + 2$ is obtained by moving the graph of $y = |x|$ up two units, and the graph of $y = |x + 2|$, by moving the graph of $y = |x|$ two units to the left.**

