5-10 Technology: Families of Lines

Objective To use a handheld to explore families of linear functions

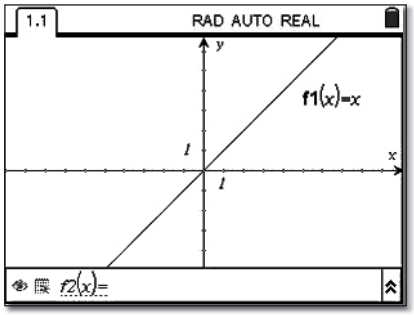
Families of functions are functions that have similar characteristics, for example, the same slope or the same y-intercept.

► You can use a handheld to see how the value of the y-intercept, b, affects the graph of $y = mx + b$.

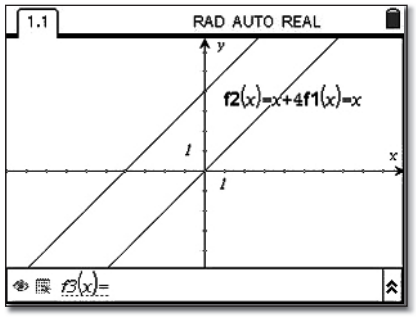
Step 1 Press (home) 2 to select **Graphs & Geometry**.

Step 2 Type x, then press enter to graph the line.

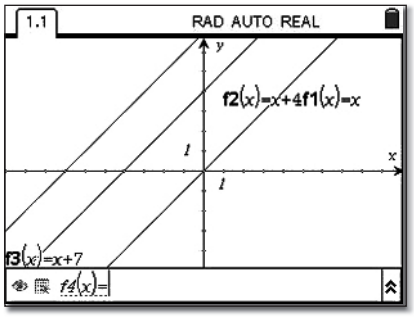
The most basic of a family of functions is called the parent function. The parent linear function is $y = x$.



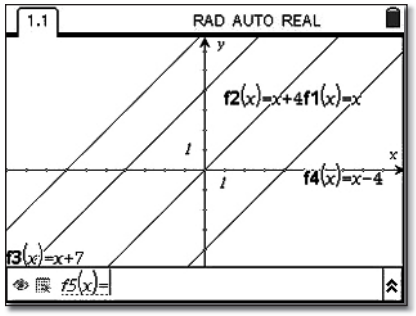
Step 3 Input $x + 4$, then press enter.



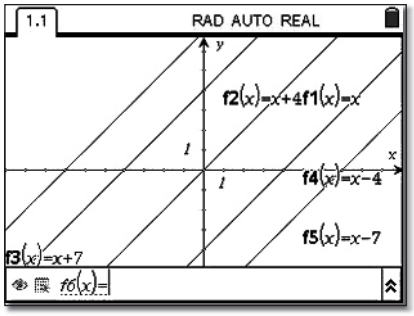
Step 4 Input $x + 7$, then press enter.



Step 5 Input $x - 4$, then press enter.



Step 6 Input $x - 7$, then press enter.



Note that the value of b shifts the graph *up* or *down*. If b is positive, such as in $x + 4$, then the graph is shifted *up*. If b is negative, such as in $x - 4$, the graph is shifted *down*. The lines are *all* parallel because they all have a slope of +1.

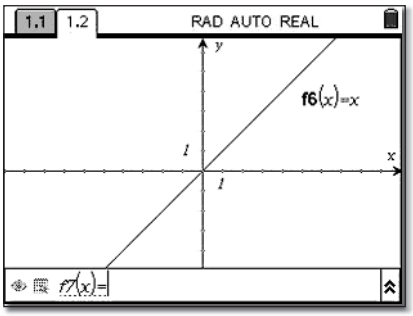
Predict how the graphs of the functions $y = 5x$, $y = 5x + 4$, $y = 5x + 8$, $y = 5x - 3$, and $y = 5x - 6$ will be *similar* to each other and how they will be *different*. Then use your handheld to verify the prediction.

The equations have the form $y = mx + b$. They have the *same slope* +5, therefore the lines will be parallel.

So the graph of $y = 5x + 4$ and $y = 5x + 8$ will be shifted *up* from $y = 5x$ and the graphs of $y = 5x - 3$ and $y = 5x - 6$ will be shifted *down*.

▶ You can also use a handheld to see how the value of the slope, m, affects the graph of $y = mx + b$.

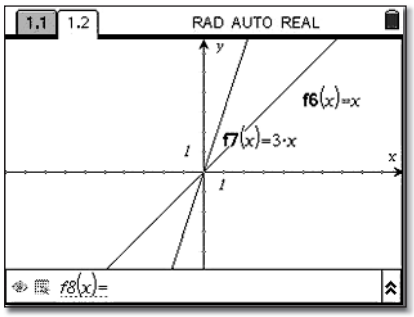
Graph the equations $y = x$, $y = 3x$, $y = 0.5x$, $y = -4x$, and $y = -0.25x$. How does the value of m affect the graph?



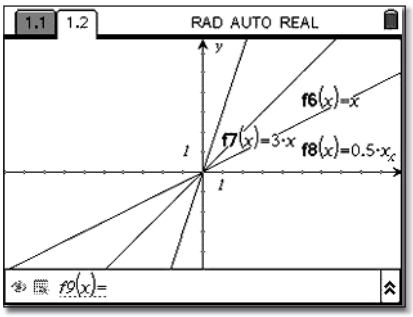
Step 1 Press ⌂.
Then choose 2
to select **Graphs & Geometry**.

Step 2 Input the parent linear function $f1(x) = x$, then press enter to graph the line.

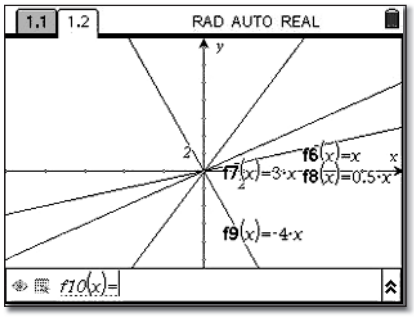
Step 3 Input $3x$, then press enter.



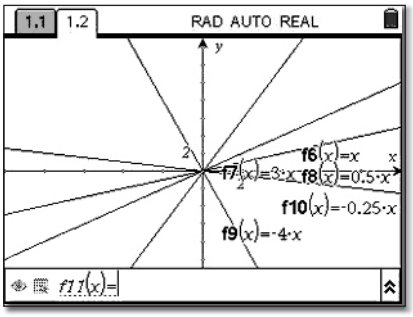
Step 4 Input $0.5x$, then press enter.



Step 5 Input $-4x$, then press enter.



Step 6 Input $-0.25x$, then press enter.



Note that the value of m changes the *steepness* of the graph. If m is positive, then the graph has a *positive slope*. If m is negative, the graph has a *negative slope*. The greater the absolute value of m, the greater the steepness of the line.

Try These

Predict how the graphs of the functions will compare. Use a handheld to verify your prediction.

1. $y = -7x$, $y = -7x + 4$, $y = -7x + 6$, $y = -7x - 3$, and $y = -7x - 8$

2. $y = x$, $y = 3x$, $y = 0.5x$, $y = -6x$, and $y = -0.75x$

3. **Discuss and Write** Explain how the graphs of the equations $y = 4x + 1$ and $y = -4x + 1$ will be similar and how they will be different. Explain how the graphs of the equations $y = 2x - 4$ and $y = 2x + 5$ will be similar and how they will be different.

Go to PRACTICE BOOK Lesson 5-10 for exercise sets.