

The Family of Linear Functions

The parent function of the family of linear functions is $f(x) = x$. You can use a graphing calculator to investigate how changing the parameters m and b in $f(x) = mx + b$ affects the graphs as compared to the parent function.

ACTIVITY 1 b in $f(x) = mx + b$ **MENU** 5

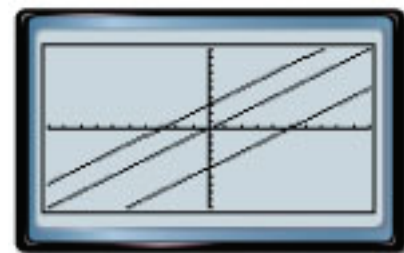
Graph $f(x) = x$, $f(x) = x + 3$, and $f(x) = x - 5$ in the standard viewing window.

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

Then graph the equations.

KEYSTROKES: **X,T** **EXE** **X,T** **+** 3 **EXE** **X,T** **-** 5 **EXE** **F6**

- 1A. Compare and contrast the graphs.
- 1B. How would you obtain the graphs of $f(x) = x + 3$ and $f(x) = x - 5$ from the graph of $f(x) = x$?



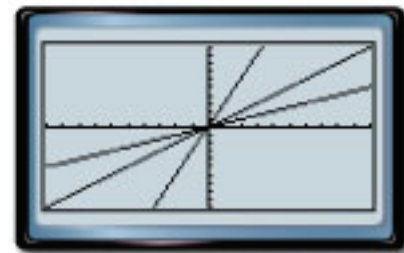
The parameter m in $f(x) = mx + b$ affects the graphs in a different way than b .

ACTIVITY 2 m in $f(x) = mx + b$

Graph $f(x) = x$, $f(x) = 3x$, and $f(x) = \frac{1}{2}x$ in the standard viewing window.

Enter the equations in the Y= list and graph.

- 2A. How do the graphs compare?
- 2B. Which graph is steepest? Which graph is the least steep?
- 2C. Graph $f(x) = -x$, $f(x) = -3x$, and $f(x) = \frac{1}{2}x$ in the standard viewing window. How do these graphs compare?



ANALYZE THE RESULTS

Graph each set of equations on the same screen. Describe the similarities or differences among the graphs.

1. $f(x) = 3x$ 2. $f(x) = x + 2$ 3. $f(x) = x - 3$
 $f(x) = 3x + 1$ $f(x) = 5x + 2$ $f(x) = 2x - 3$
 $f(x) = 3x - 2$ $f(x) = \frac{1}{2}x + 2$ $f(x) = 0.75x - 3$
4. What do the graphs of equations of the form $f(x) = mx + b$ have in common?
5. How do the values of b and m affect the graph of $f(x) = mx + b$ as compared to the parent function $f(x) = x$?
6. Summarize your results. How can knowing about the effects of m and b help you sketch the graph of a function?