

The parent function of the family of linear functions is  $f(x) = x$ . You can use a Sharp EL-9900C 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 $f(x) = mx + b$

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

Clear the calculator memory first.

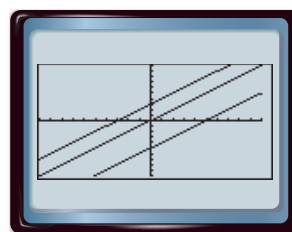
KEYSTROKES:  $\boxed{2\text{ndF}}$   $\boxed{[\text{OPTION}]}$   $\boxed{[\text{ALPHA}]}$   $\boxed{[E]}$   $\boxed{2}$   $\boxed{[\text{CL}]}$   $\boxed{[\text{ENTER}]}$

Enter the equations in the  $\boxed{Y=}$  list as Y1, Y2, and Y3. Then graph the equations.

KEYSTROKES:  $\boxed{Y=}$   $\boxed{X/\theta/\tau/n}$   $\boxed{[\text{ENTER}]}$   $\boxed{X/\theta/\tau/n}$   $\boxed{+}$   $\boxed{3}$   
 $\boxed{[\text{ENTER}]}$   $\boxed{X/\theta/\tau/n}$   $\boxed{-}$   $\boxed{5}$   $\boxed{[\text{ENTER}]}$   $\boxed{[\text{ZOOM}]}$   $\boxed{5}$

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  $f(x) = x$ ?



$[-10, 10]$  scl: 1 by  $[-10, 10]$  scl: 1

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.

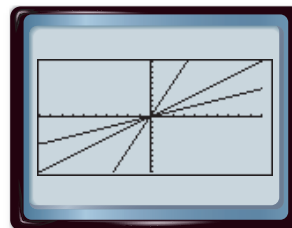
Enter the equations in the  $\boxed{Y=}$  list and graph.

KEYSTROKES:  $\boxed{Y=}$   $\boxed{[\text{CL}]}$   $\boxed{X/\theta/\tau/n}$   $\boxed{[\text{ENTER}]}$   $\boxed{[\text{CL}]}$   $\boxed{3}$   $\boxed{X/\theta/\tau/n}$   $\boxed{[\text{ENTER}]}$   $\boxed{[\text{CL}]}$   
 $\boxed{(}$   $\boxed{1}$   $\boxed{\div}$   $\boxed{2}$   $\boxed{)}$   $\boxed{X/\theta/\tau/n}$   $\boxed{[\text{ENTER}]}$   $\boxed{[\text{GRAPH}]}$

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?



$[-10, 10]$  scl: 1 by  $[-10, 10]$  scl: 1

## Analyze the Results

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

1.  $f(x) = 3x$

$$f(x) = 3x + 1$$

$$f(x) = 3x - 2$$

2.  $f(x) = x + 2$

$$f(x) = 5x + 2$$

$$f(x) = \frac{1}{2}x + 2$$

3.  $f(x) = x - 3$

$$f(x) = 2x - 3$$

$$f(x) = 0.75x - 3$$

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?