

Graphing Technology Lab

Family of Linear Graphs

Sharp EL-9900C

A **family of functions** is a set of functions that is related in some way. The family of linear functions has the parent function $y = x$.

A Sharp EL-9900C calculator allows you to enter a function and manipulate the graph. This is useful for investigating families of linear functions because you can easily compare characteristics such as slopes and y -intercepts.



ACTIVITY

Graph $y = 2x + 6$ in the default viewing window and move the line to see how the equation relates to the graph.

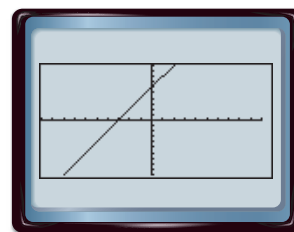
Step 1 Graph $y = 2x + 6$ in the default viewing window.

- Clear calculator first.

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

- Enter the equation.

KEYSTROKES: $\boxed{Y=}$ $\boxed{2}$ $\boxed{X/\theta/T/n}$ $\boxed{+}$ $\boxed{6}$ $\boxed{\text{Zoom}}$ $\boxed{5}$: Default

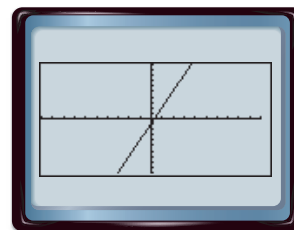


$[-10, 10]$ scl: 1 by $[-10, 10]$ scl: 1

Step 2 Change the graph by changing the numbers in the $\boxed{Y=}$ window.

- Graph $y = 3x - 1$.

KEYSTROKES: $\boxed{Y=}$ $\boxed{\text{CL}}$ $\boxed{3}$ $\boxed{X/\theta/T/n}$ $\boxed{-}$ $\boxed{1}$ $\boxed{\text{GRAPH}}$



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

When graphing, be sure to use a viewing window that shows both the x - and y -intercepts of the graph of a function. If you need to set your own minimum and maximum values for the axes and the scale factor, use the $\boxed{\text{WINDOW}}$ option from the graphing keys.

Exercises

Graph $y = 3x - 4$. Graph other lines that are in the same family of $y = 3x$.

1. What changes in the equation? What remains the same?
2. How does adding or subtracting a constant b to a linear function affect its graph?
3. Move the line until it crosses the y -axis as near to 5 as possible. Write the equation of the line.
4. Write an equation of the line that is parallel to $y = 3x - 4$ and passes through the origin.

Graph the following lines.

$$Y1 = -2x$$

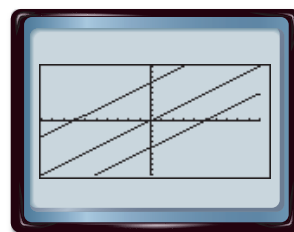
$$Y2 = -2x + 1$$

$$Y3 = \frac{1}{2}x + 1$$

5. Describe the similarities and differences between the graphs.

Three functions with a slope of 1 are graphed in the standard viewing window, as shown.

6. Write an equation for each, beginning with the left-most graph.
7. Does the equation $y = -x - 5$ have any special relationships with any of the above equations?
8. Write another equation that is part of this family of functions.



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

9. **GARDENING** A garden center charges \$75 per cubic yard for topsoil. The delivery fee is \$25.
 - a. Write the equation that represents the charges.
 - b. Describe the change in the graph if the delivery fee is changed to \$35.
 - c. How does the graph change if the price of a cubic yard of topsoil is increased to \$80 when the delivery fee is \$35?
 - d. What are the prices of a cubic yard of topsoil and delivery if the graph has slope 70 and y -intercept 40?