

Discovering Graph Shape with the Graphing Calculator

Why do the graphs of some functions have the same shape? Can you determine the shape of a graph just by looking at the equation? In this exploration, we will use a graphing calculator to answer these questions.

Part 1:

First you must adjust the view of the graph that you will be seeing. To do this, follow these steps:

1. Press the **[Zoom]** button and scroll down and select "6: ZStandard"
2. Press the **[Zoom]** button again and scroll down and select "5: ZSquare"

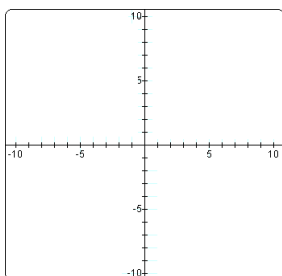
Part 2:

Graph each of the following equations on the graphing calculator by following these steps:

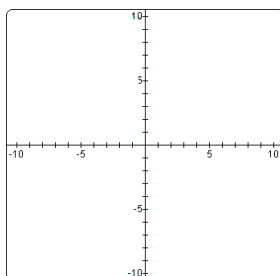
1. Press the **[Y=]** button
2. Enter the equation into Y1=
3. Press **[Graph]**

Then Sketch the graph in the space provided next to each equation.

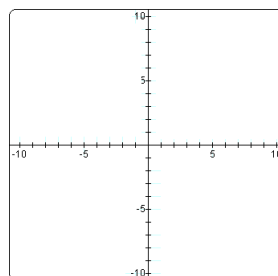
a.) $y = x + 3$



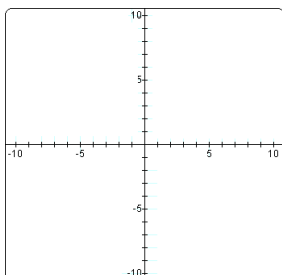
b.) $y = -3x - 4$



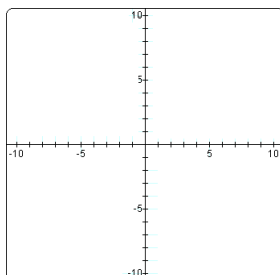
c.) $y = x^2$



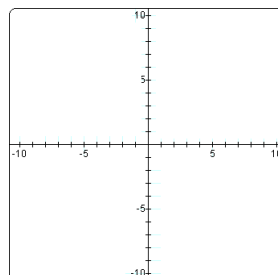
d.) $y = \sqrt{x}$



e.) $y = x^2 + 3$



f.) $y = -\sqrt{x}$

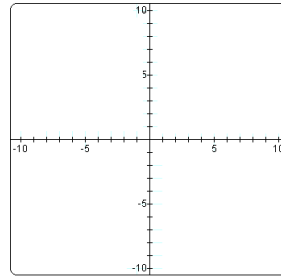
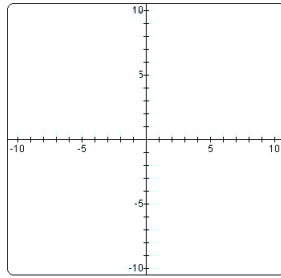
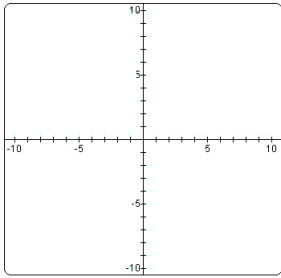


g.) $y = -\sqrt{x} + 3$

h.) $y = (x+3)^2$

i.) $y = |x|$

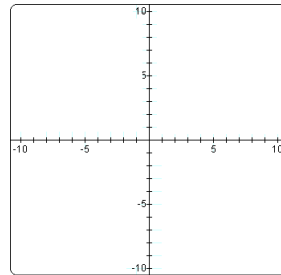
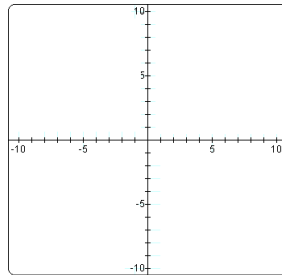
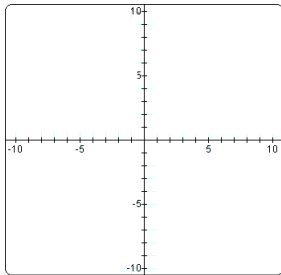
(To enter Absolute Value, type [2nd], [ABS], [X,T,Θ], [)])



j.) $y = \sqrt{x+1}$

k.) $y = -|x|+3$

l.) $y = |x-2|$



After graphing these equations, you should see some similarities in the shapes of the graphs. Answer the following about the graphs:

1. Describe the shape of graphs (a) and (b) : _____
Why are these graphs similar?

2. Describe the shape of graphs (c), (e), and (h) : _____
Why are these graphs similar?

3. Describe the shape of graphs (d), (f), (g) and (j) : _____
Why are these graphs similar?

4. Describe the shape of graphs (i), (k), and (l) : _____
Why are these graphs similar?

Part 3

Now that you can predict the shape of a graph, let's see how we can predict the position of a graph.

Absolute Value Function

First let's look at the Absolute Value function. For each set of graphs, determine how the changing number changes the shape or position of the graph.

1. Graph the following equations (the expression inside the abs. Value must be in parentheses):

$$y=|x| \quad y=|x+1| \quad y=|x+2| \quad y=|x+3| \quad y=|x-1| \quad y=|x-2|$$

How do these changing numbers change the position of the graph?

2. Graph the following equations (don't use parenthesis):

$$y=|x| \quad y=|x|+1 \quad y=|x|+2 \quad y=|x|+3 \quad y=|x|-1 \quad y=|x|-2$$

How do these changing numbers change the position of the graph?

3. Graph the following equations (the expression inside the abs. Value must be in parentheses):

$$y=|x| \quad y=|3x| \quad y=|-3x| \quad y=|-5x| \quad y=|(1/2)x| \quad y=|(1/8)x|$$

How do these changing numbers change the position of the graph?

4. Graph the following equations:

$$y=|x| \quad y=3|x| \quad y=-3|x| \quad y=-5|x| \quad y=(1/2)|x| \quad y=(1/8)|x|$$

How do these changing numbers change the position of the graph?

If a, b, c, and d represent real numbers, then the general form of a Absolute Value function can be written as:

$$y=a|bx+c|+d$$

How do a, b, c, and d change the shape or position of the graph?

a:

b:

c:

d:

Square Root Function

Now let's look at the Square Root function. For each set of graphs, determine how the changing number changes the shape or position of the graph.

1. Graph the following equations (the expression inside the square root must be in parentheses):

$$y = \sqrt{x} \quad y = \sqrt{x+1} \quad y = \sqrt{x+2} \quad y = \sqrt{x-1} \quad y = \sqrt{x-2}$$

How do these changing numbers change the position of the graph?

2. Graph the following equations (don't use parenthesis):

$$y = \sqrt{x} \quad y = \sqrt{x} + 1 \quad y = \sqrt{x} + 2 \quad y = \sqrt{x} - 1 \quad y = \sqrt{x} - 2$$

How do these changing numbers change the position of the graph?

3. Graph the following equations (the expression inside the square root must be in parentheses):

$$y = \sqrt{x} \quad y = \sqrt{2x} \quad y = \sqrt{3x} \quad y = \sqrt{-x} \quad y = \sqrt{-2x} \quad y = \sqrt{-3x}$$

How do these changing numbers change the position of the graph?

4. Graph the following equations:

$$y = \sqrt{x} \quad y = 2\sqrt{x} \quad y = 3\sqrt{x} \quad y = -\sqrt{x} \quad y = -2\sqrt{x} \quad y = -3\sqrt{x}$$

How do these changing numbers change the position of the graph?

If a, b, c, and d represent real numbers, then the general form of a Square Root function can be written as:

$$y = a\sqrt{(bx+c)} + d$$

How do a, b, c, and d change the shape or position of the graph?

a:

b:

c:

d:

Part 4

Predicting Graphs

Without graphing, describe how the following graphs differ from the graph of

$$y = |x|$$

1. $y = |x| + 32$

2. $y = |x| - 54$

3. $y = |x - 111|$

4. $y = |x + 115|$

5. $y = |5x|$

6. $y = -|x|$

Without graphing, describe how the following graphs differ from the graph of

$$y = \sqrt{x}$$

1. $y = \sqrt{x} + 54$

2. $y = \sqrt{x} - 98$

3. $y = \sqrt{x - 86}$

4. $y = \sqrt{x + 65}$

5. $y = -\sqrt{10x}$

6. $y = \sqrt{-10x}$