

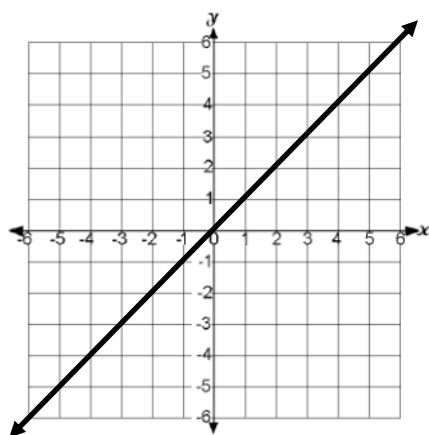
## Graphing Family of Functions

### Linear Function

"Mother Function"

$$y = x$$

$x$	$y$
-2	-2
-1	-1
0	0
1	1
2	2



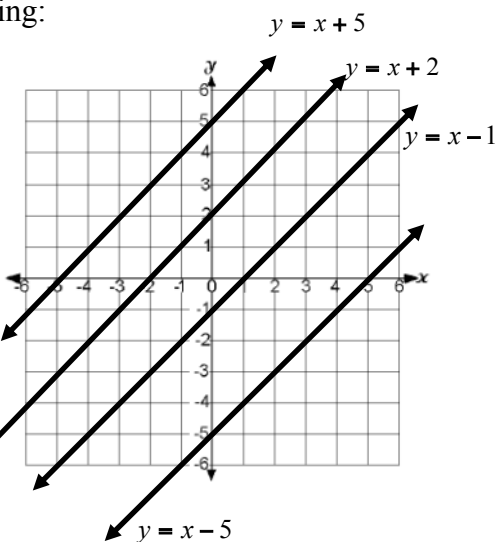
\*See the lesson to get more ideas of what to do here.

Graph the following:

- $y = x + 2$
- $y = x - 5$

Given the graph, write the equation of the line.

- $y = x + 5$
- $y = x - 1$

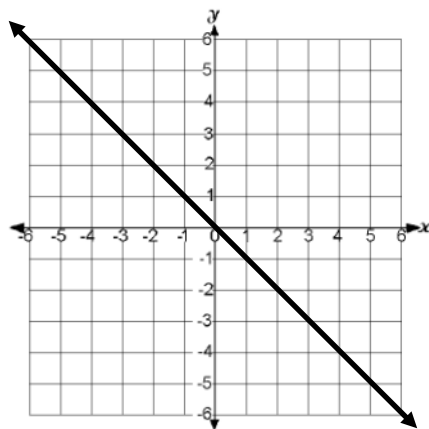


### Linear Function

"Father Function"

$$y = -x$$

$x$	$y$
-2	2
-1	1
0	0
1	-1
2	-2



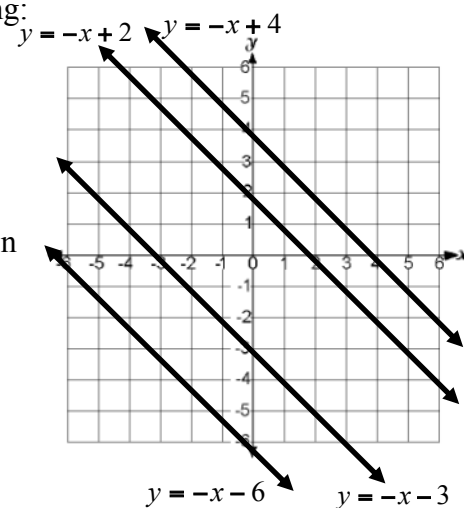
\*See the lesson to get more ideas of what to do here.

Graph the following:

- $y = -x + 4$
- $y = -x - 3$

Given the graph, write the equation of the line.

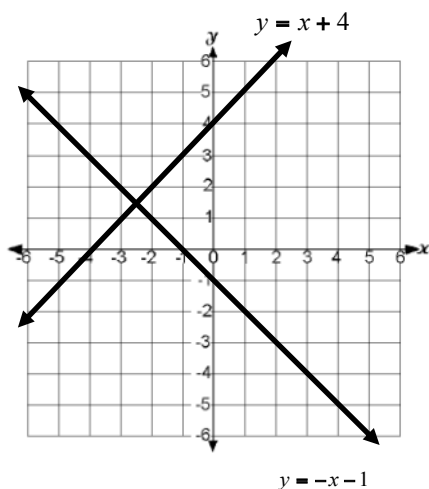
- $y = -x + 2$
- $y = -x - 6$



**You Try:**

Graph:

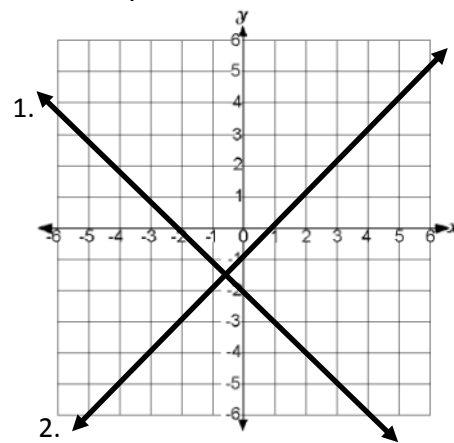
- $y = x + 4$
- $y = -x - 1$



**You Try:**

Given the graphs, write the equation of the line:

- $y = -x - 2$
- $y = x - 1$



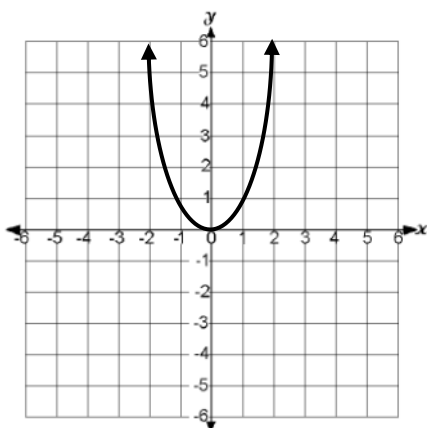
## Graphing Family of Functions

### Quadratic Function

"Mother Function"

$$y = x^2$$

$x$	$y$
-2	4
-1	1
0	0
1	1
2	4



\*See the lesson to get more ideas of what to do here.

Graph the following:

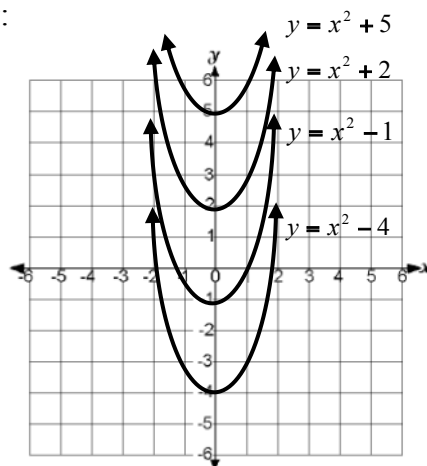
1.  $y = x^2 + 2$

2.  $y = x^2 - 4$

Given the graph, write the equation of the parabola.

3.  $y = x^2 + 5$

4.  $y = x^2 - 1$

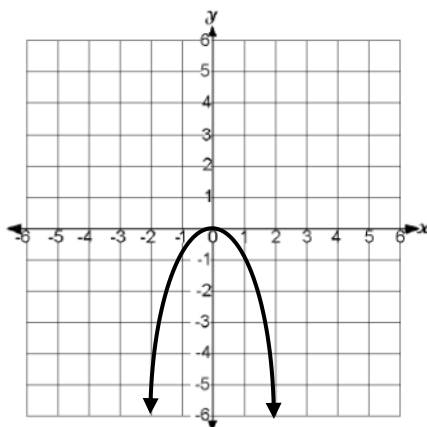


### Quadratic Function

"Father Function"

$$y = -x^2$$

$x$	$y$
-2	-4
-1	-1
0	0
1	-1
2	-4



\*See the lesson to get more ideas of what to do here.

Graph the following:

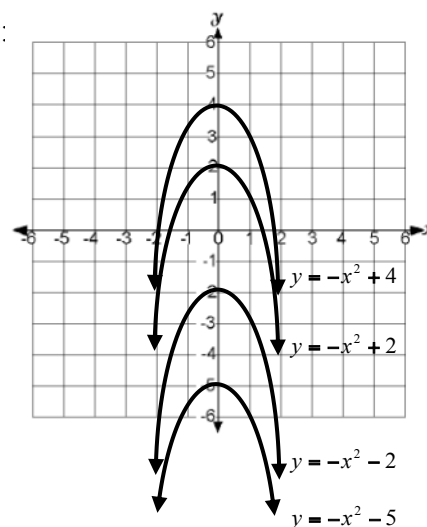
1.  $y = -x^2 + 4$

2.  $y = -x^2 - 2$

Given the graph, write the equation of the parabola.

3.  $y = -x^2 + 2$

4.  $y = -x^2 - 5$

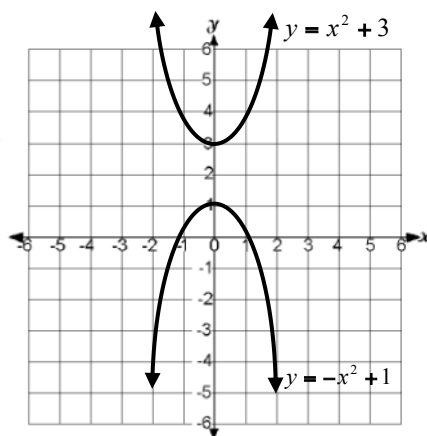


**You Try:**

Graph:

1.  $y = -x^2 + 1$

2.  $y = x^2 + 3$

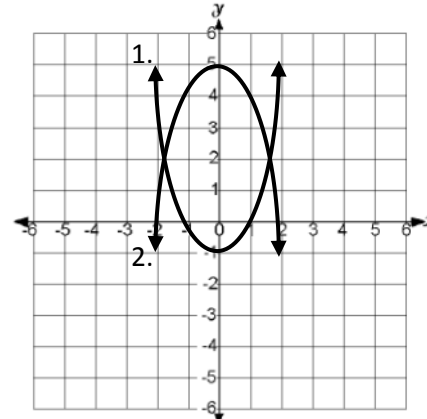


**You Try:**

Given the graph, write the equation of the line:

1.  $y = x^2 - 1$

2.  $y = -x^2 + 5$



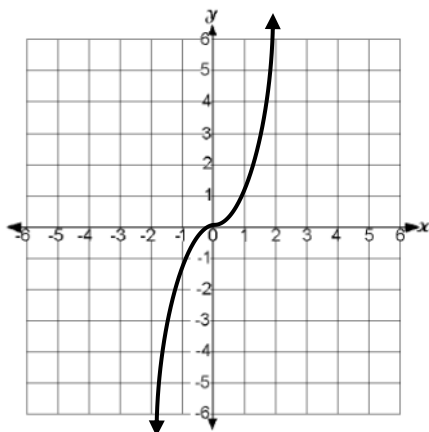
## Graphing Family of Functions

### Cubic Function

"Mother Function"

$$y = x^3$$

$x$	$y$
-2	-8
-1	-1
0	0
1	1
2	8



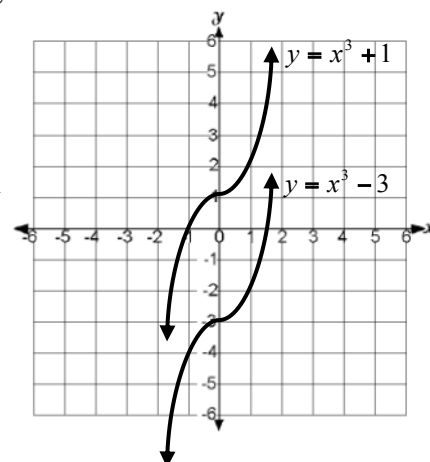
\*See the lesson to get more ideas of what to do here.

Graph the following:

1.  $y = x^3 + 1$

Given the graph, write the equation of the cubic.

2.  $y = x^3 - 3$

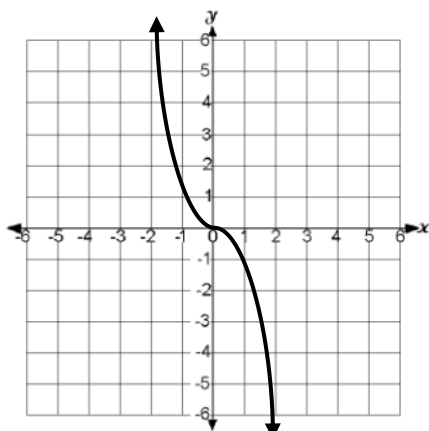


### Cubic Function

"Father Function"

$$y = -x^3$$

$x$	$y$
-2	8
-1	1
0	0
1	-1
2	-8



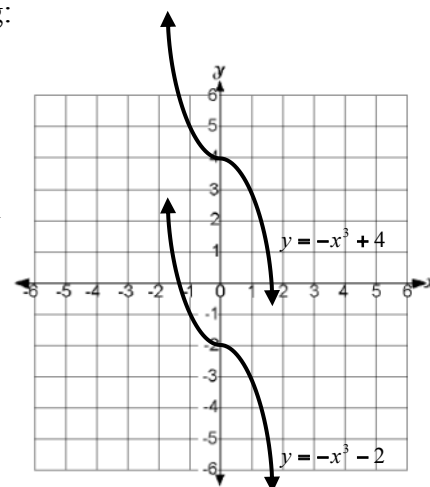
\*See the lesson to get more ideas of what to do here.

Graph the following:

1.  $y = -x^3 + 4$

Given the graph, write the equation of the cubic.

2.  $y = -x^3 - 2$

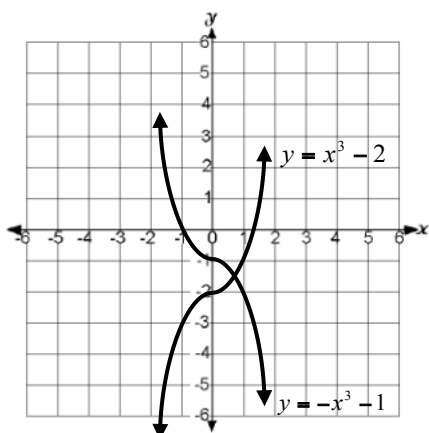


**You Try:**

Graph:

1.  $y = x^3 - 2$

2.  $y = -x^3 - 1$

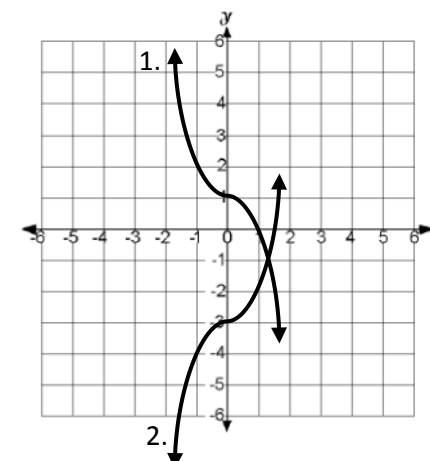


**You Try:**

Given the graphs, write the equation of the line:

1.  $y = -x^3 + 1$

2.  $y = x^3 - 3$



## Graphing Family of Functions Lines, Parabola's and Cubic's

### Materials:

- Copies of Family of Functions handout.
- Overhead cutout of a line, parabola and cubic for each student.
- Ruler may help with drawing a line.

### Lesson:

Start by filling out the graphing family of functions handout for a line.

In the first box, explore everything you can about the mother function of a line. You can use this box to do the following:

- Graph the mother function  $y = x$ .
- Use a table to get the coordinates, as well as, to use for discussion/ explanation of vertical shift later.
- Discuss how the equation  $y = x$  has all values equal ( $1 = 1$ ).
- Show how to get points on the line by rising 1 and running 1.

In the box next to the mother, start by graphing the first equation  $y = x + 2$  and then doing the same for the other equation  $y = x - 5$ . Use the mother and table to help explain what is happening with the graph.

- Show how adding 2 to the mother, or any number, increases numbers in the table by 2.
- Show how adding 2 to the mother, or any number, shifts the graph up 2.
- Physically put the overhead of a line on the mother and move it up 2.
- Show how to get points on the line by rising 1 and running 1.
- Do the same for subtracting a number.

Next have students find the equation of a line given a graph. Graph the points  $(1, 6)$  and  $(-6, -1)$  to draw the line and get the equation. Then doing the same for the other line, graph the points  $(3, 2)$  and  $(-2, -3)$ .

- Put the overhead line on top of the graph to show that it is the mother, then write part of the equation knowing it is the mother function.
- Look for the shift up or down and see how many units it moved, then write the added or subtracted value.

Now explore the father function, doing everything above except the following.

- Discuss how values are not equal but instead opposites.
- Graph the following points to find the equations of the lines.
  - For equation one,  $(-1, 3)$  and  $(3, -1)$ . For equation two,  $(-5, -1)$  and  $(-1, -5)$ .

Finally, discuss positive and negative slopes using the quadrants as a guide. For positive slopes they go through quadrant 1  $(+, +)$  and 3  $(-, -)$ . For negative slopes they go through quadrant 2  $(-, +)$  and 4  $(+, -)$ .

Before giving the students the you tries, have students look at the problems and turn to a partner to explain what part of the equation/ graph makes it a mother or father and what part of the equation/ graph gives a vertical shift up or down. Have each student pick one to explain, so they each get a turn for both you tries.

Move onto filling out the graphing family of functions handout for a parabola.

Do everything you did for the line adding the following specifically for a parabola:

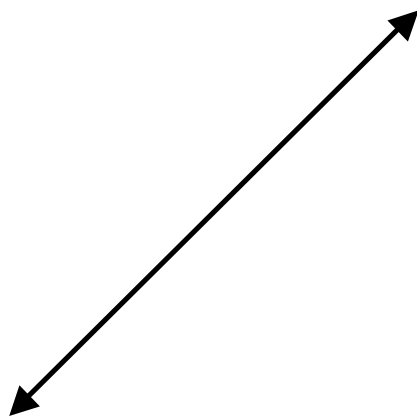
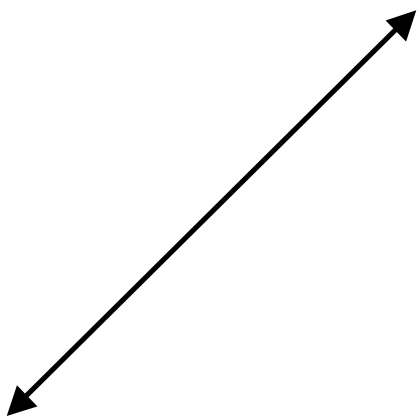
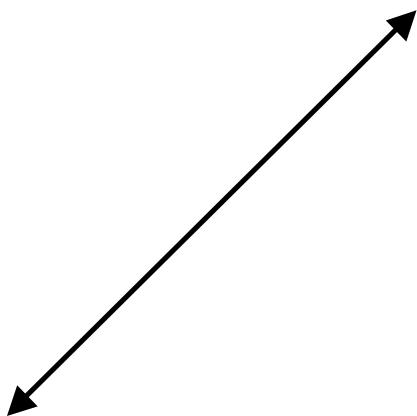
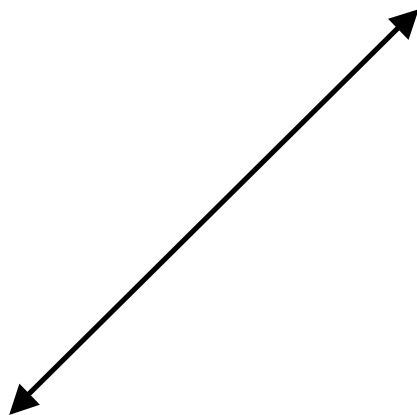
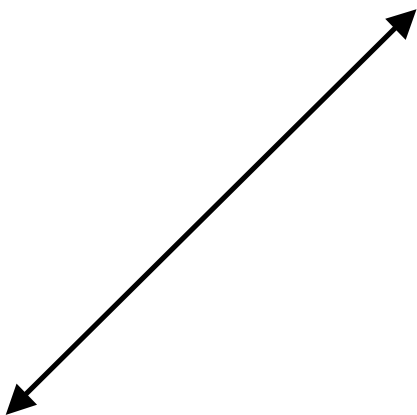
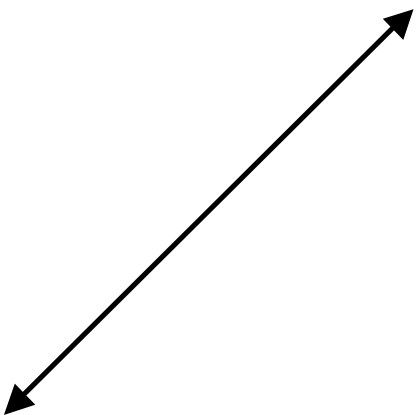
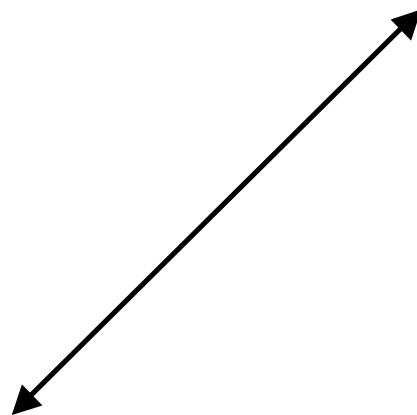
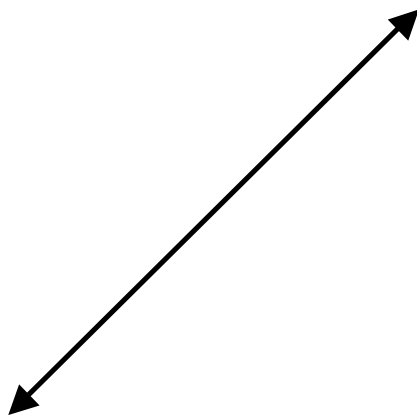
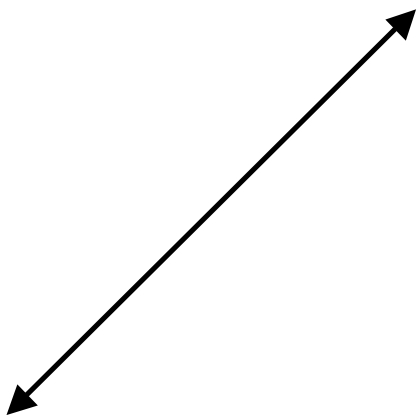
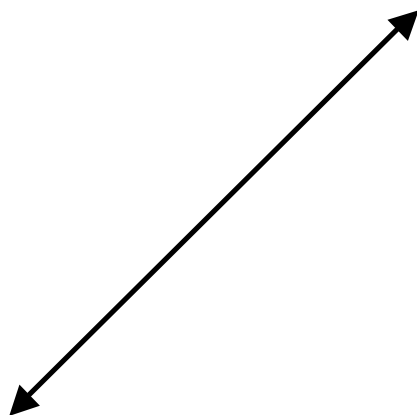
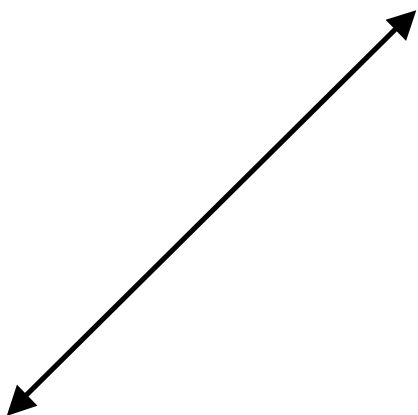
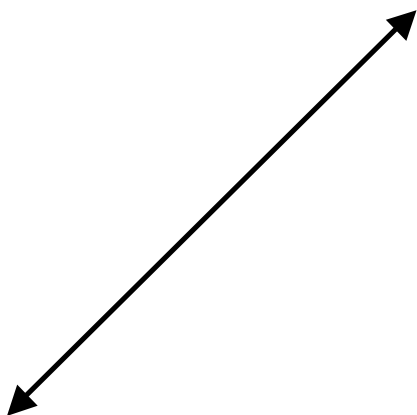
- Discuss the relationship between  $x$  and  $y$  that  $y$  is the  $x$  value times itself or squared. This will explain the positive answers. Then explain the negative values for the father because the negative sign.
- Show how the  $y$  values in the table match up because of the squared in the equation. Also, show how the values match up in the graph making it symmetric or a reflection over the  $y$ -axis. You can use the overhead of the parabola to show the reflection.

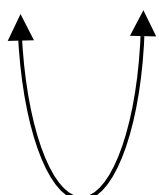
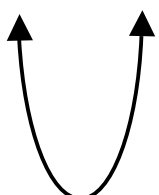
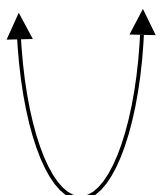
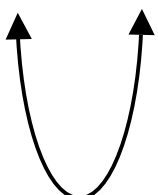
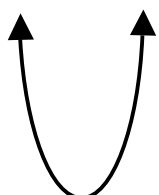
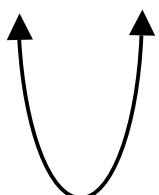
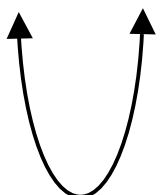
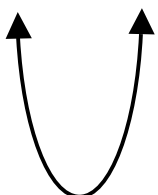
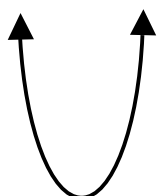
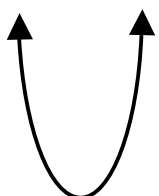
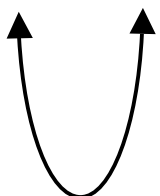
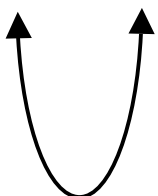
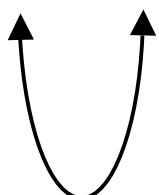
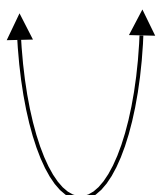
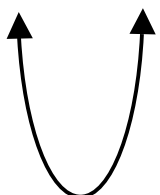
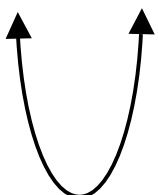
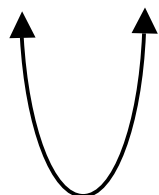
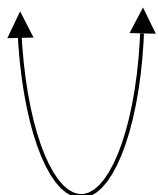
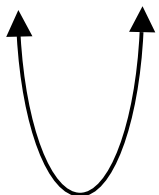
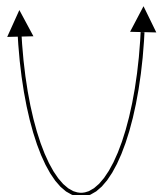
Move onto filling out the graphing family of functions handout for a cubic.

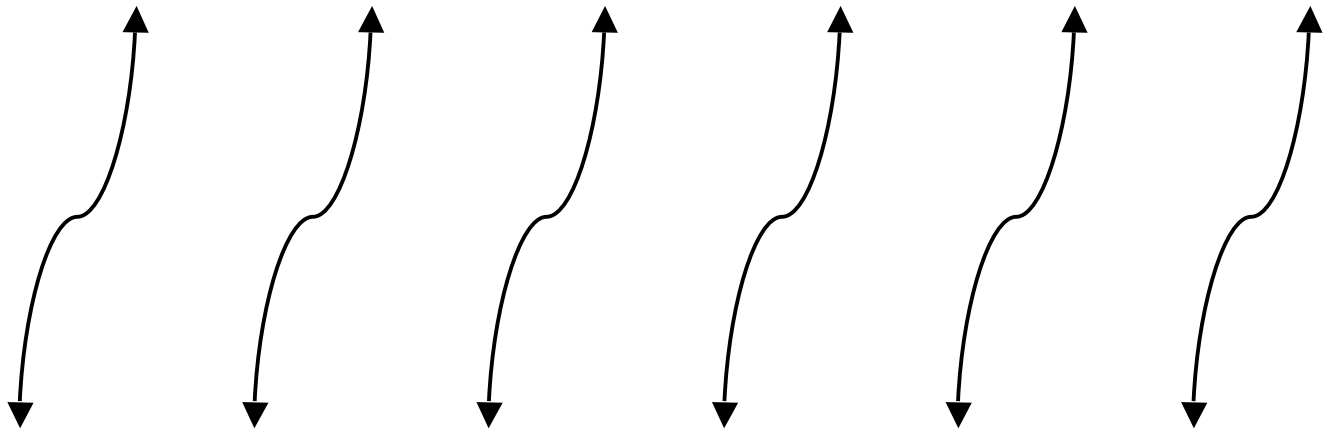
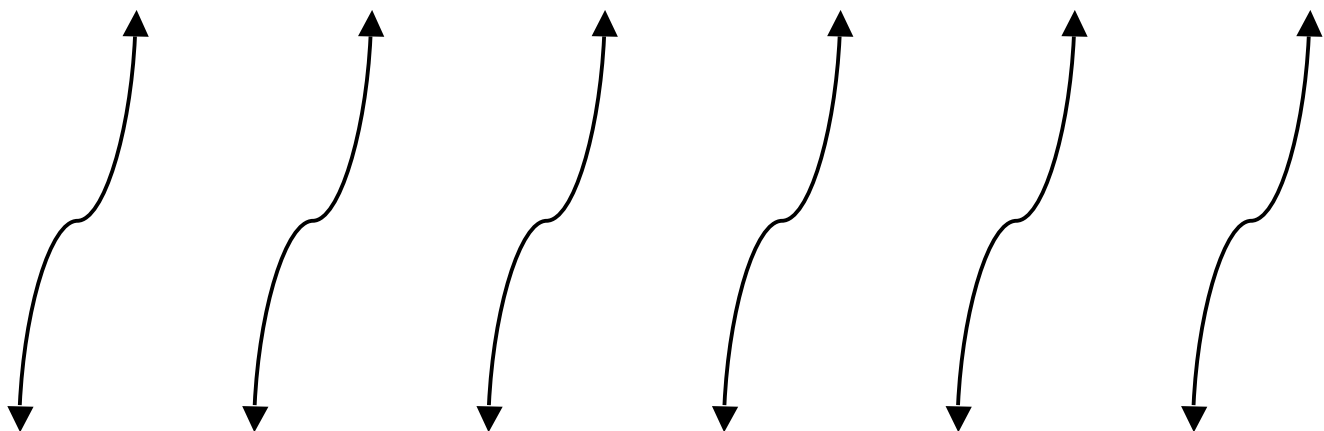
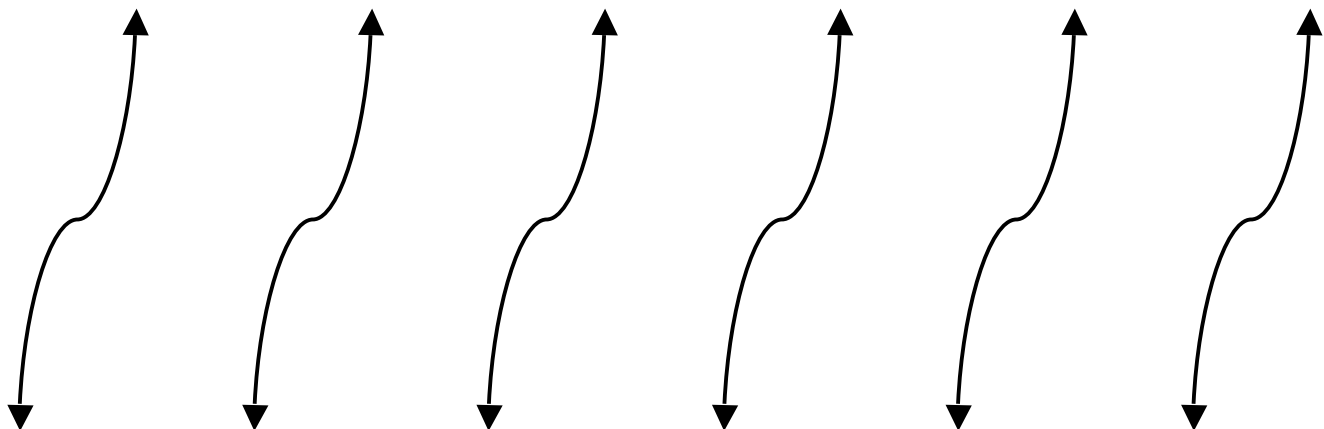
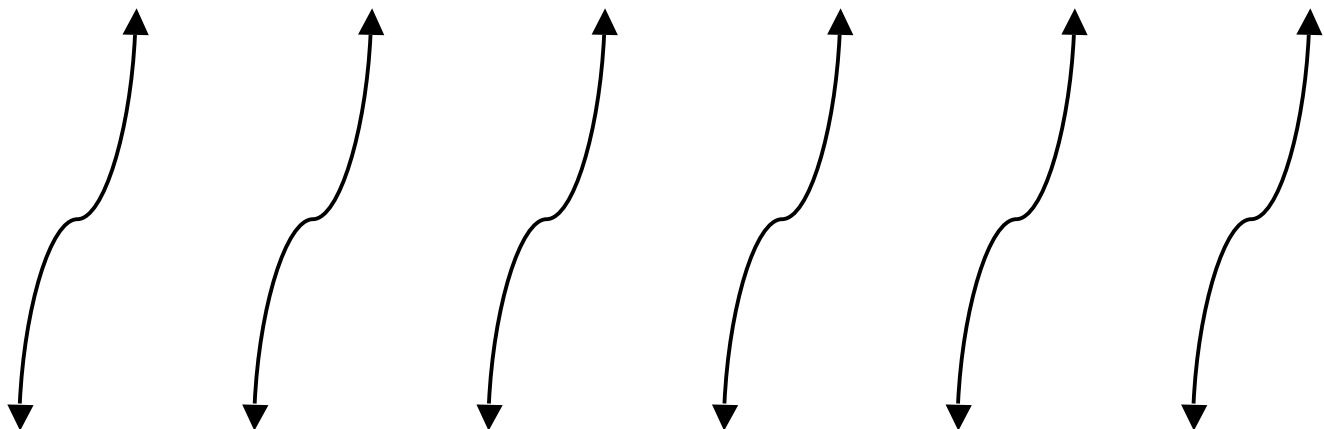
Do everything you did for the line adding the following specifically for a cubic:

- Discuss the relationship between  $x$  and  $y$  that  $y$  is the  $x$  value times itself 3 times or cubed.
- Show how the  $y$  values in the table do not match up like before because of the cubed in the equation. Also, show the differences of the graph of a cubic to a parabola. You can use the overhead of the parabola and cubic to help.

The 4th page of graphs can be used to show students a change in slope for linear functions or horizontal shifts for quadratics and cubic's.







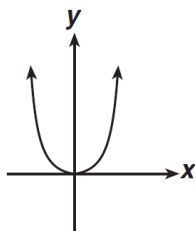


# Warm - Up

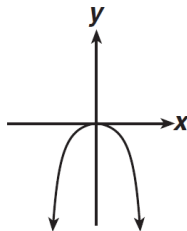
March 13th

## 1. CST – 7th grade

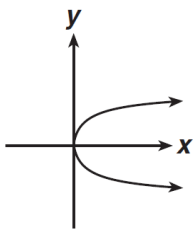
Which graph shows  $y = -x^2$ ?



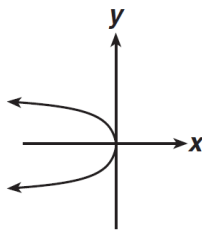
A



C



B

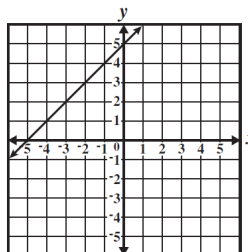


D

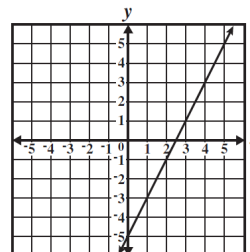
7AF 3.1

## 2. CST – 7th grade

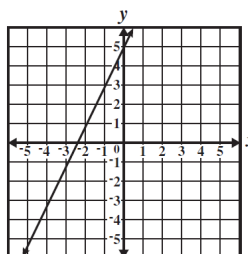
51 Which *best* represents the graph of  $y = 2x - 5$ ?



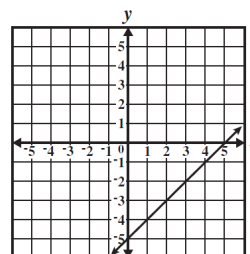
A



C



B

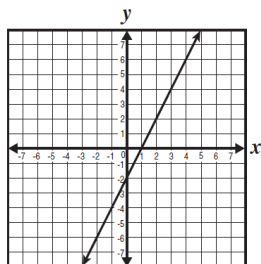


D

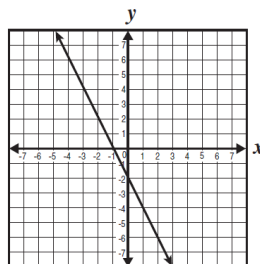
7AF 3.3

## 3. CST – Algebra

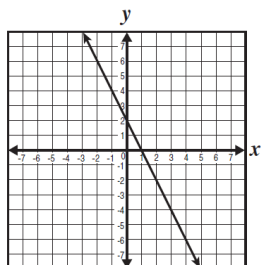
28 Which *best* represents the graph of  $y = 2x - 2$ ?



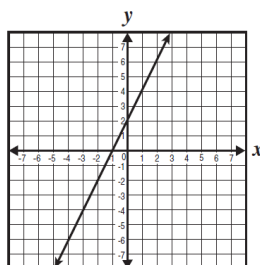
A



C



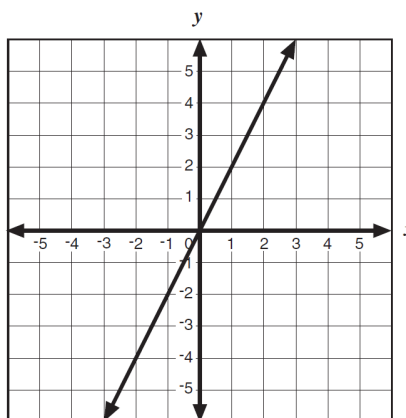
B



D

ALG 6.0

## 4. CST – Algebra



Which equation *best* represents the graph above?

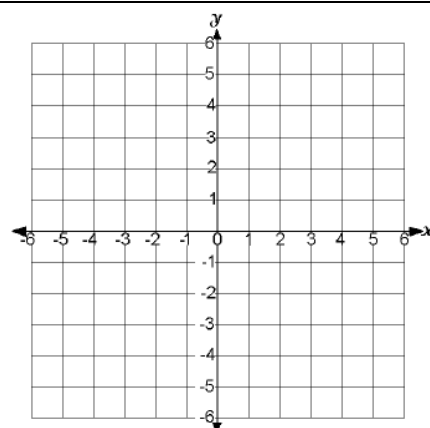
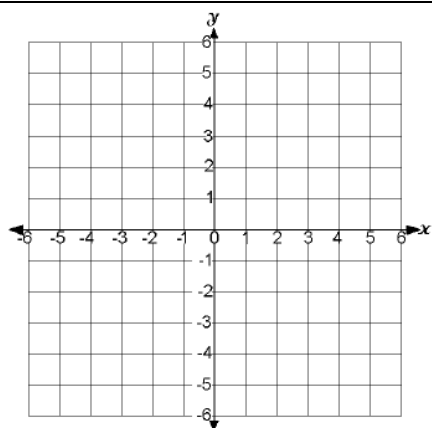
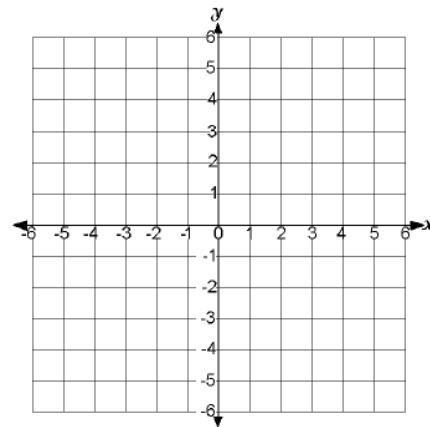
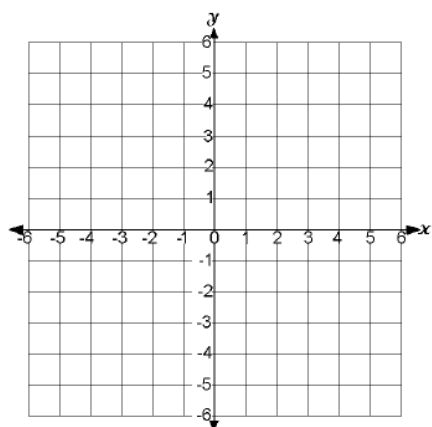
- A  $y = x$
- B  $y = 2x$
- C  $y = x + 2$
- D  $y = 2x + 2$

ALG 6.0

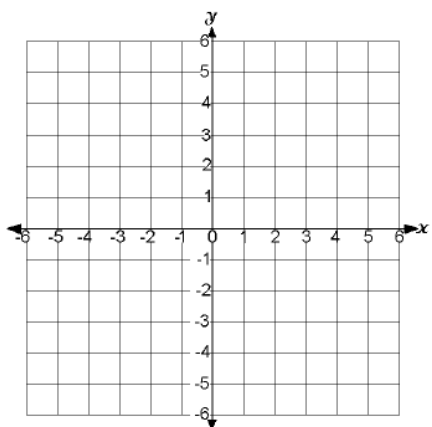
Name: \_\_\_\_\_

Date: \_\_\_\_\_

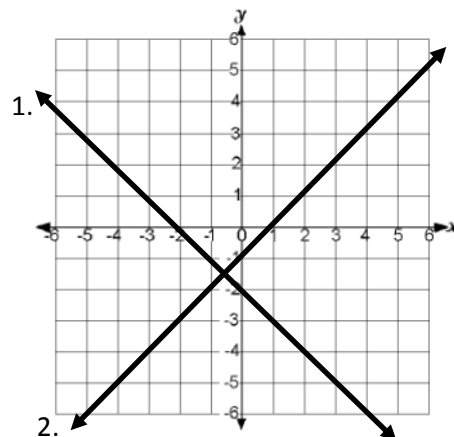
## Graphing Family of Functions



**You Try:**



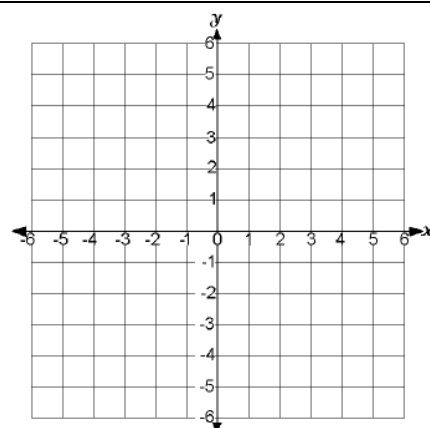
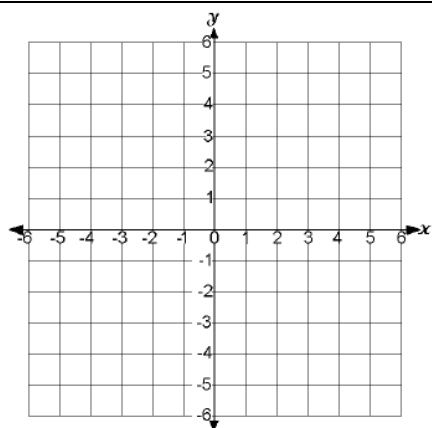
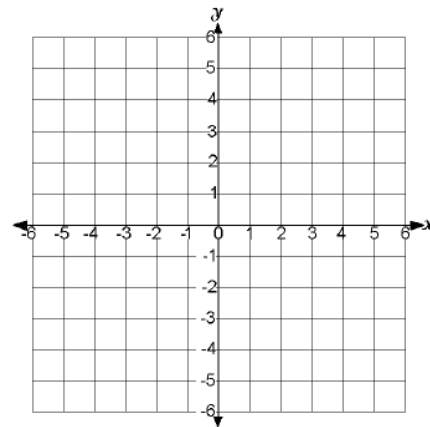
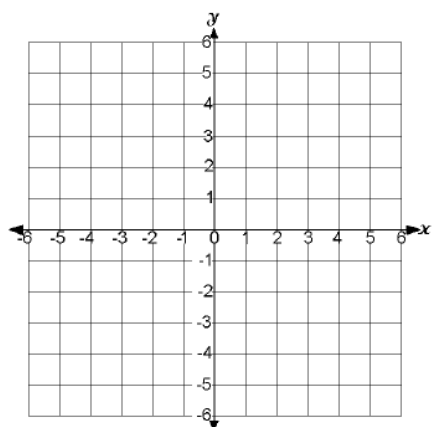
**You Try:**



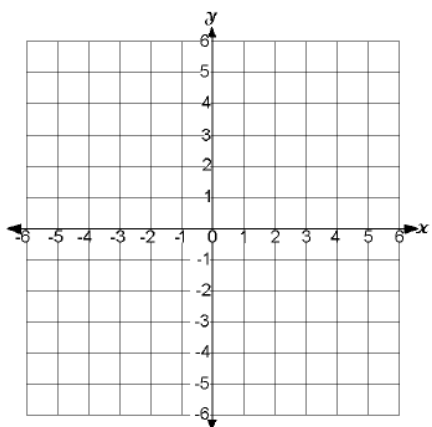
Name: \_\_\_\_\_

Date: \_\_\_\_\_

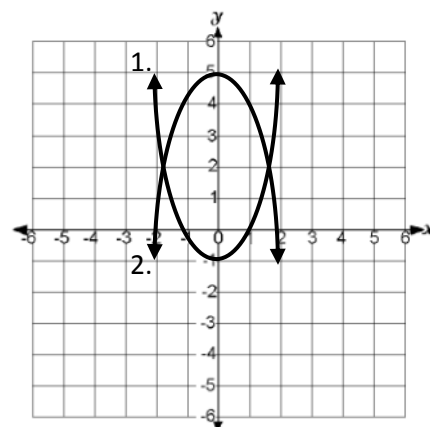
## Graphing Family of Functions



**You Try:**



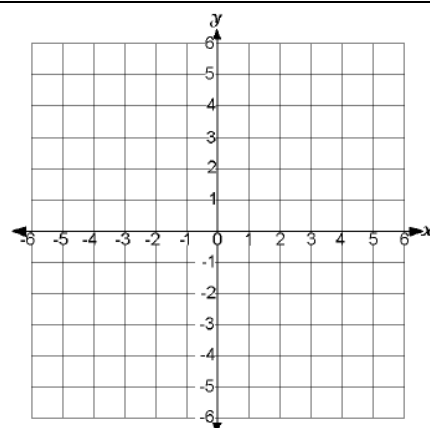
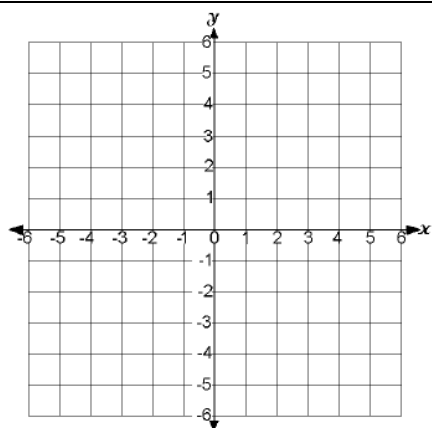
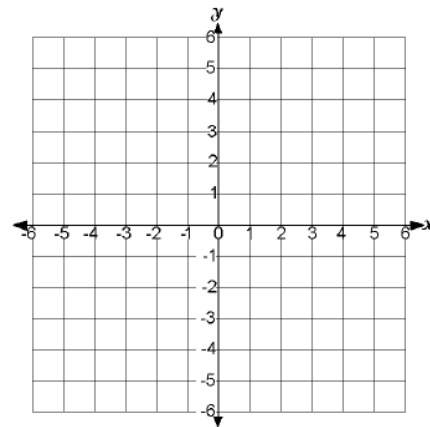
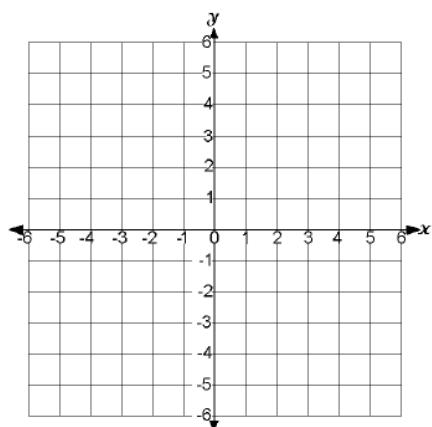
**You Try:**



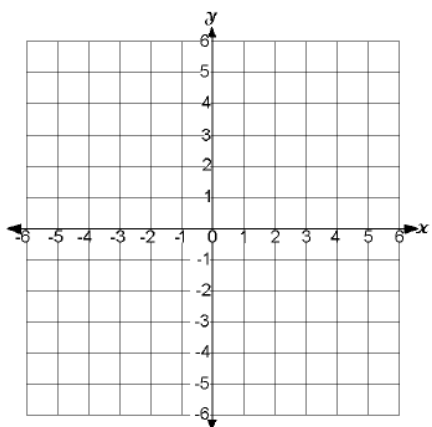
Name: \_\_\_\_\_

Date: \_\_\_\_\_

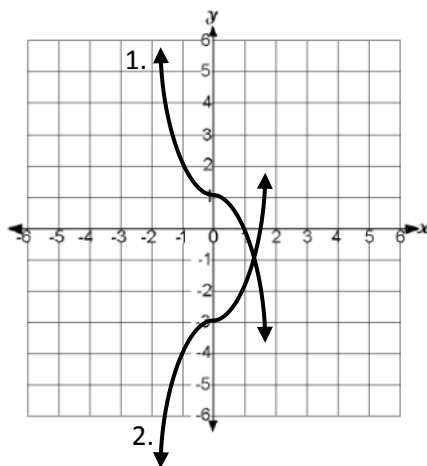
## Graphing Family of Functions



**You Try:**



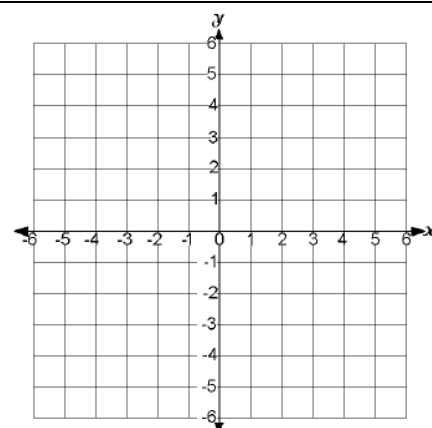
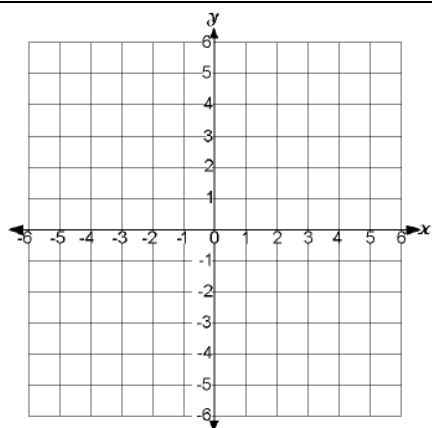
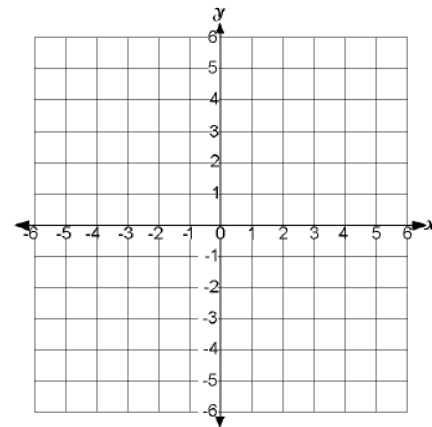
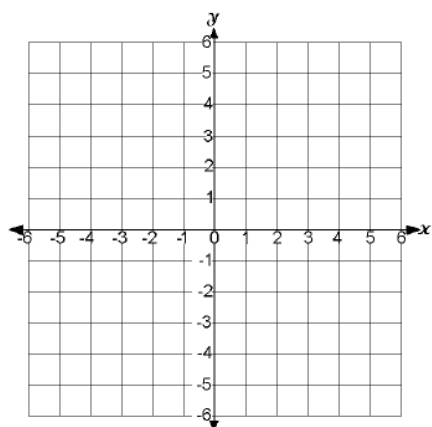
**You Try:**



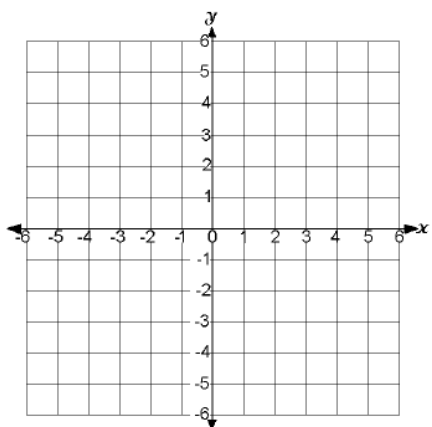
Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Graphing Family of Functions



**You Try:**



**You Try:**

