

Welcome

-Please place cell phones in holder.

Solve:

$$f(x) = 3x^3 + 10x^2 + 18x + 20$$

$$\begin{array}{r|rrrr} -2 & 3 & 10 & 18 & 20 \\ & \downarrow & -6 & -8 & -20 \\ \hline & 3 & 4 & 10 & \boxed{0} \end{array}$$

$$3x^2 + 4x + 10 = 0$$

$$b^2 - 4ac$$

$$(4)^2 - 4(3)(10)$$

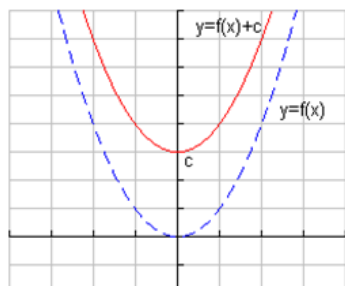
$$\sqrt{-104}$$

Translations

$y = f(x) + c, c > 0$

Translates the graph c units up

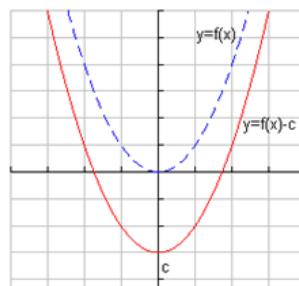
$x^2 + 3$



$y = f(x) - c, c > 0$

Translates the graph c units down

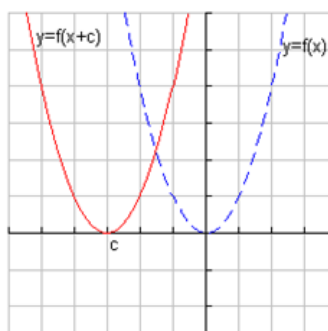
x^2



$x^2 - 3$

$$y = f(x+c), c > 0$$

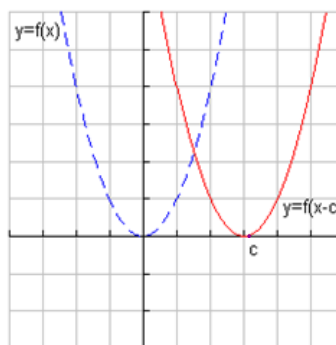
Translates the graph c units left



$$(x+3)^2$$

$$y = f(x-c), c > 0$$

Translates the graph c units right



$$(x-3)^2$$

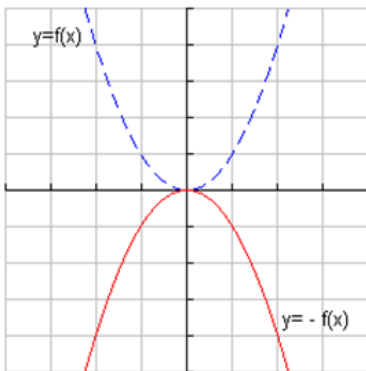
x^2

—

Vertical

$$y = -f(x), c > 0$$

Is reflected over the x-axis



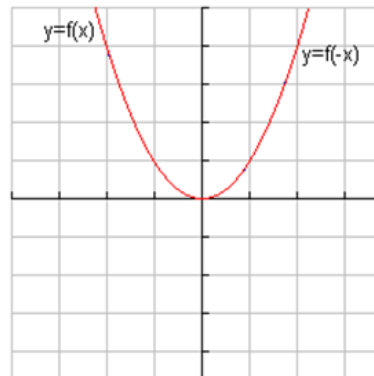
$-x^2$

Reflections

Horizontal

$$y = f(-x), c > 0$$

Is reflected over the y-axis



x^2

$(-x)^2$

DESCRIBE THE TRANSFORMATIONS FOR THE GIVEN EXPRESSIONSFor parent functions $f(x)$, $g(x)$, or $h(x)$

1) $f(x - 1) + 2$

2) $h(x + 7) + 8$

3) $f(x - 1)$

Shifts Right 1

Shifts up 2

4) $-f(x) + 2$

5) $g(-x) - 9$

6) $-h(x + 6)$

Reflection
over x
axis
up 2Reflection
over
y-axis
down 9**GENERAL FORM FOR TRANSFORMATIONS of FUNCTION $f(x)$: $a \cdot f(x - h) + k$**

"h" = horizontal shift		"k" = vertical shift		"a" = vertical or horizontal reflection	
Right	$x + h$	up	$y + k$	vertical (x-axis)	$-y$
Left	$x - h$	down	$y - k$	horizontal (y-axis)	$-x$

QUADRATIC:

- Parent Function: $f(x) = x^2$

- Transformation Function:

$$-(x \pm h)^2 \pm k$$

- Important Point: (h, k)

Vertex

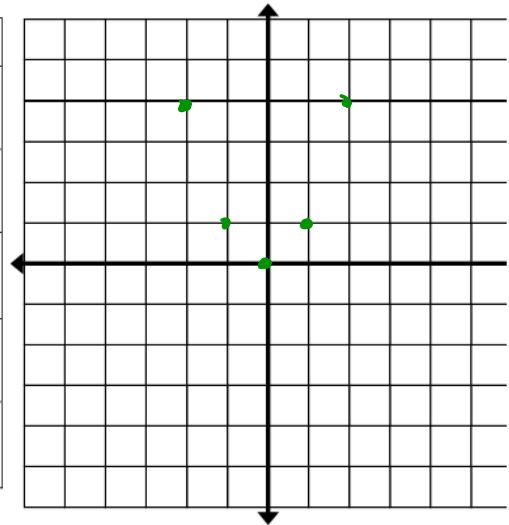
- Generic Shape:



- DOMAIN: All real number

- RANGE: $y \leq k$ or $y \geq k$
neg. pos.

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



CUBIC: "ODD FUNCTION"

- Parent Function: $f(x) = x^3$

Transformation Function:

$$-(-x \pm h)^3 \pm k$$

- Important Point: (h, k)

Inflection point

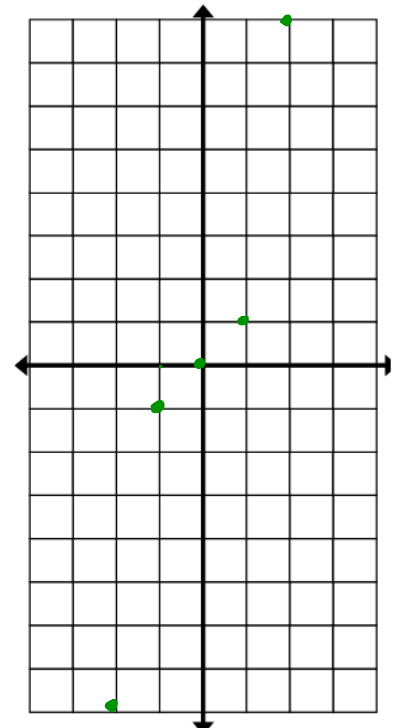
- Generic Shape:



- DOMAIN: All Real Numbers

- RANGE: All Real Numbers

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



Quartic:

- Parent Function: $f(x) = x^4$

- Transformation Function:

$$-(x \pm h)^4 \pm k$$

- Important Point: (h, k)

None

- Generic Shape:

W ↙ ↘

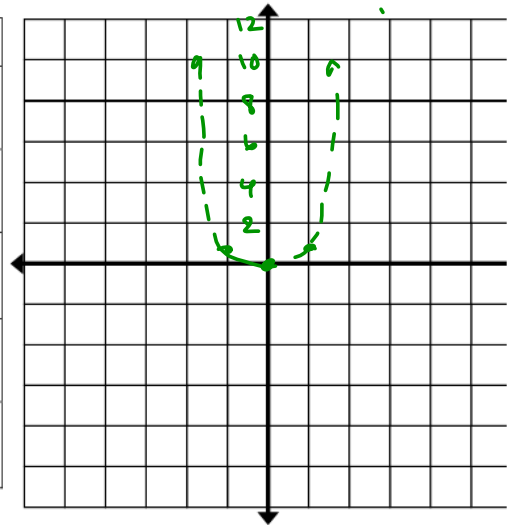
- DOMAIN:

All Real Number

- RANGE:

↪ $y \geq k$ positive ↻ $y \leq k$ neg. ↻

x	y
-2	16
-1	1
0	0
1	1
2	16



Quintic: "ODD FUNCTION"

- Parent Function: $f(x) = x^5$

- Transformation Function:

$$-(x \pm h)^5 \pm k$$

- Important Point: (h, k)

None

- Generic Shape:

↻ ↻

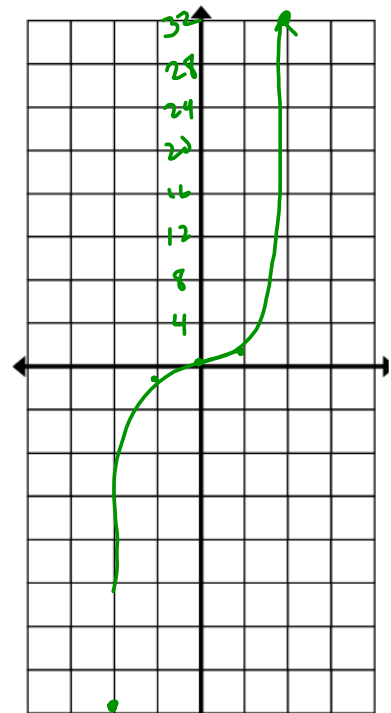
- DOMAIN:

All Real number

- RANGE:

All Real numbers

x	y
-2	-32
-1	-1
0	0
1	1
2	32

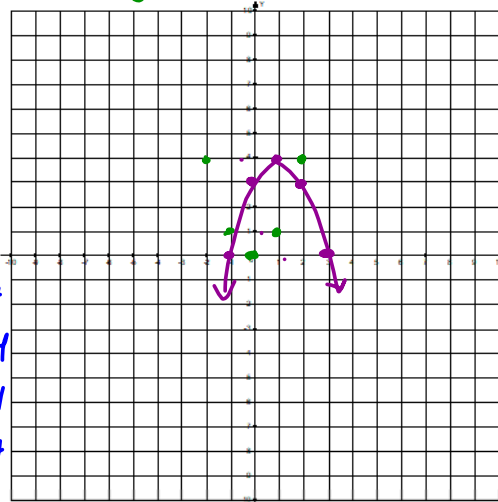


Describe the transformations by completing the table and then graph the given function using the parent graph and transformations as your guide. $f(x) = -(x-1)^2 + 4$

Parent Function	Reflection across x-axis?	Vertical Stretch? Shrink? What's the scale factor?	Horizontal Shift Right? Left? How many units?	Vertical shift Up? Down? How many units?
$y = x^2$	yes	N/A	Right 1	up 4

Key Points on parent function		Transformed Points to create the graph of your function	
x	y	x+1	-y+4
-2	4	-1	0
-1	1	0	3
0	0	1	4
1	1	2	3
2	4	3	0

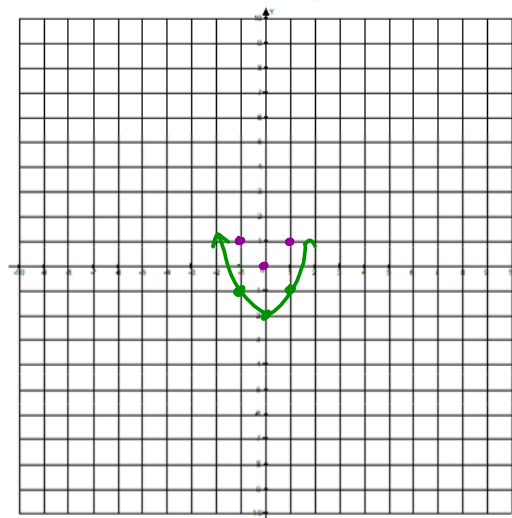
$-(4)+4$
 $-(1)+4$
 $-(0)+4$
 $-(1)+4$
 $-(4)+4$



Describe the transformations by completing the table and then graph the given function using the parent graph and transformations as your guide. $f(x) = x^2 - 2$

Parent Function	Reflection across x-axis?	Vertical Stretch? Shrink? What's the scale factor?	Horizontal Shift Right? Left? How many units?	Vertical shift Up? Down? How many units?
$y = x^2$	No	N/A	None	down 2

Key Points on parent function		Transformed Points to create the graph of your function	
x	y	x	y-2
-2	4	-2	2
-1	1	-1	-1
0	0	0	-2
1	1	1	-1
2	4	2	2

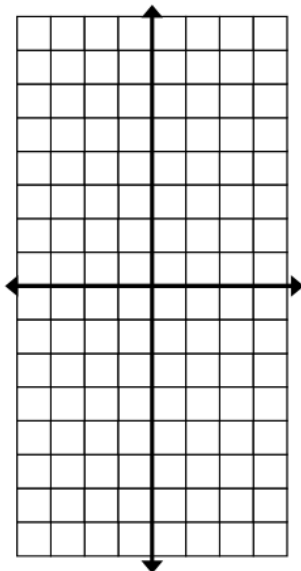


$$\begin{array}{c|c} x & y \\ \hline -2 & -8 \\ -1 & -1 \\ 0 & 0 \\ 1 & 1 \\ 2 & 8 \end{array}$$

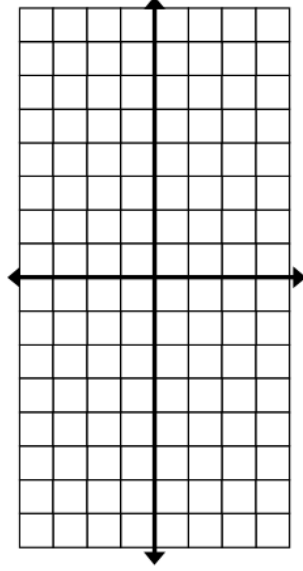
$$\begin{array}{c|c} x-4 & y+3 \\ \hline -6 & -5 \\ -5 & 2 \\ -4 & 3 \\ -3 & 4 \\ -2 & 11 \end{array}$$

Examples: Graph the following graphs and state the transformations.

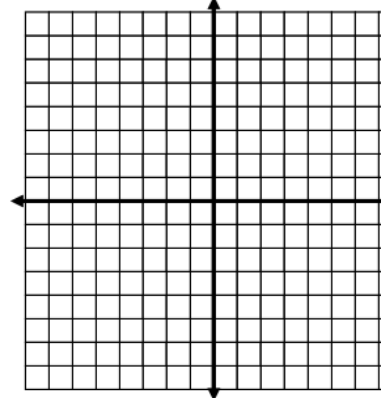
1. $y = 2(x+1)^3$



2. $y = x^3 - 3$



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



Examples: **Write the EQUATIONS with described shifts and given parent functions.**

4) $y = x^3$; Reflects and Right 3

4. _____

5) $y = x^2$ Down 2, Reflects, Vertical shrink of $1/6$

5. _____

6) $y = x^3$; Down 2, Reflects, Vertical Stretch 4

6. _____

