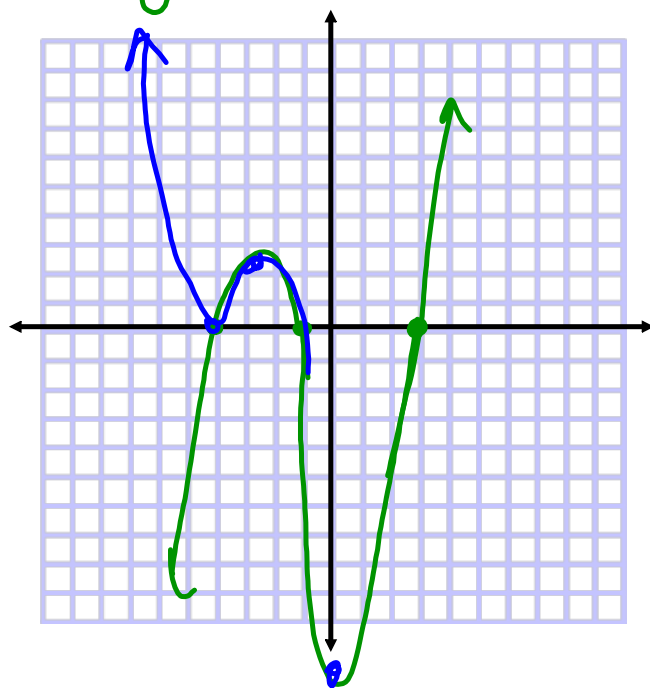


IS THIS SKETCHED CORRECTLY?

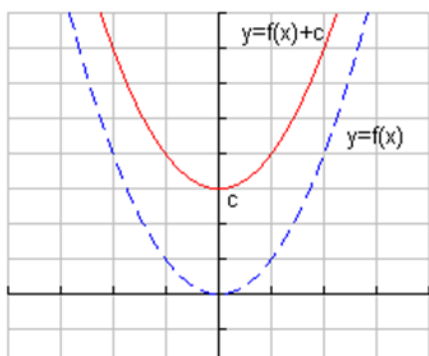
$$y = (x+4)^2(x-3)(x+1)$$



Transformations of Functions Notes**Translations**

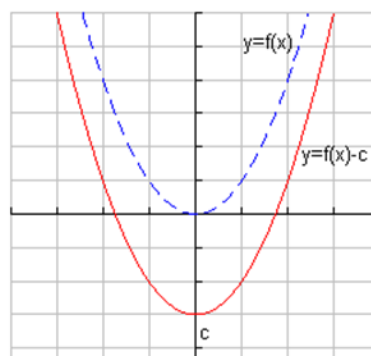
$$y = f(x) + c, c > 0$$

Translates the graph c units up



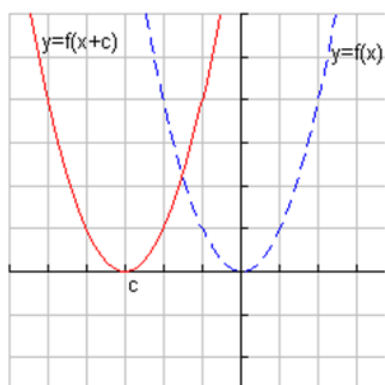
$$y = f(x) - c, c > 0$$

Translates the graph c units down



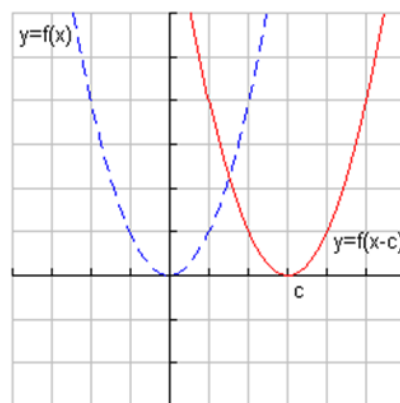
$$y = f(x+c) , c > 0$$

Translates the graph c units left



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

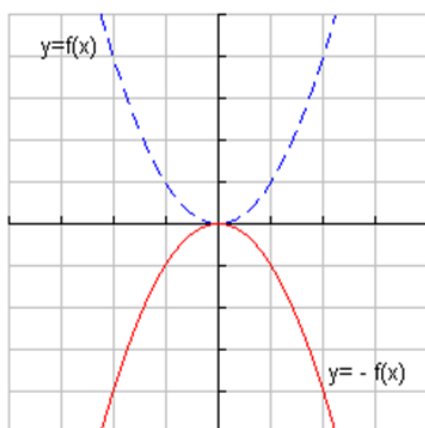
Translates the graph c units right



Reflections

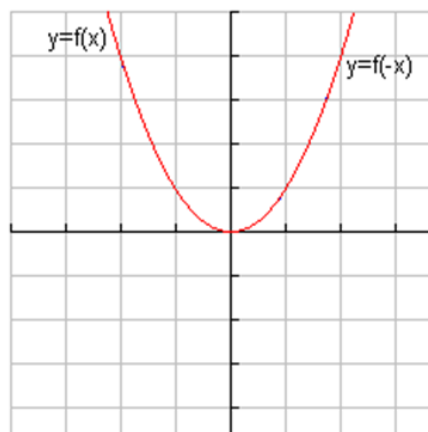
$$y = -f(x), c > 0$$

Is reflected over the x-axis



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

Is reflected over the y-axis

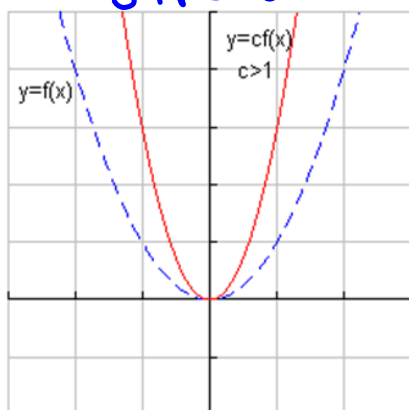


Dilations

$$y = c \cdot f(x), \quad c > 1$$

Expands the graph vertically.

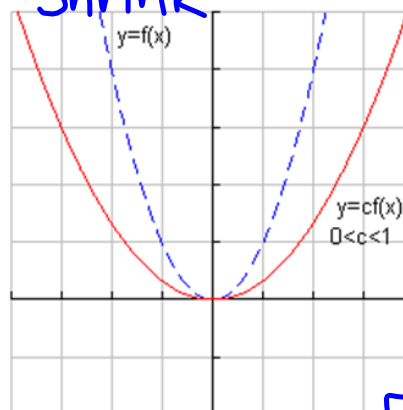
Stretch



$$y = c \cdot f(x), \quad 0 < c < 1$$

Compresses the graph vertically.

Shrink



5/7

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

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

Shifted right
1 and up 2

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

Shifted up
8 and left 7.

3) $2f(x - 1)$

Vertically stretched
by 2 and shifted
right 1.

4) $-3f(x) + 2$

Shifted up 2
units, vertically
stretched by 3, and
reflected over x-axis.

5) $\frac{1}{2}g(x) - 9$

Vertically
compressed
by $\frac{1}{2}$ and
shifted
down 9.

6) $-\frac{3}{4}h(x + 6)$

vertically
compressed by
 $\frac{3}{4}$, shifted
left 6, and
reflected over
x-axis.

GENERAL FORM FOR TRANSFORMATIONS of FUNCTION $f(x)$: $a \cdot f(x - h) + k$

"h" = horizontal shift	"k" = vertical shift	"a" = vertical dilation, contraction, and reflection
$f(x) = (x+h)$ Left	$f(x) = (x) + k$ up	$f(x) = ax, a > 1$ stretch
$f(x) = (x-h)$ Right	$f(x) = (x) - k$ down	$f(x) = ax, 0 < a < 1$ Shrink
		$f(x) = -x$ Reflect over x .

QUADRATIC:

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

- Transformation Function:

$$y = (x+2)^2 - 3$$

- Important Point: (h, k)

Vertex

- Generic Shape:

U

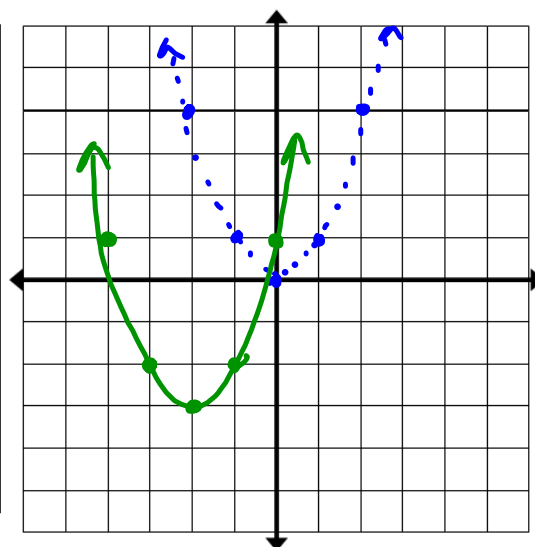
- DOMAIN:

\mathbb{R}

- RANGE:

$[k, \infty)$
 $y \geq k$

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



CUBIC: "ODD FUNCTION"

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

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

- Important Point: (h, k)
inflection point

- Generic Shape:

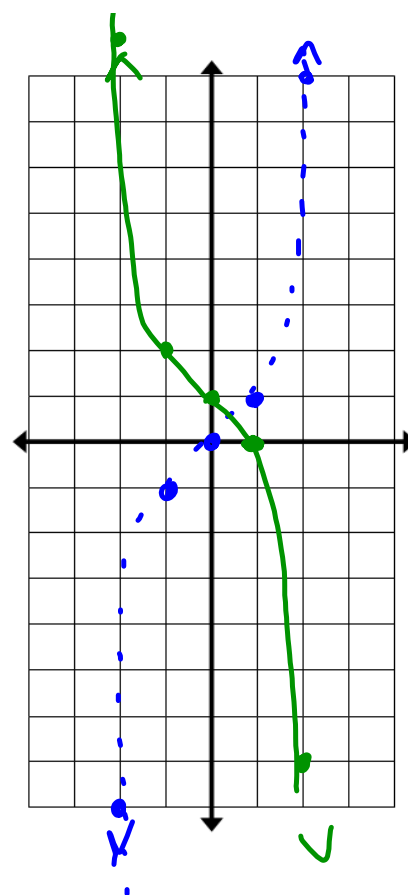
- DOMAIN:

\mathbb{R}

- RANGE:

$(-\infty, \infty)$

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



Quartic:

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

- Transformation Function:

- Important Point: (h, k)

- Generic Shape:

U

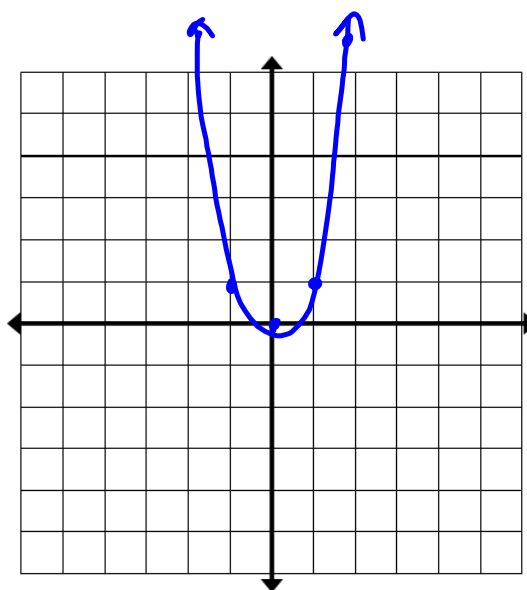
- DOMAIN:

IR

- RANGE:

 $[k, \infty)$

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



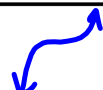
Quintic: "ODD FUNCTION"

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

Transformation Function:

- Important Point: (h, k)

- Generic Shape:



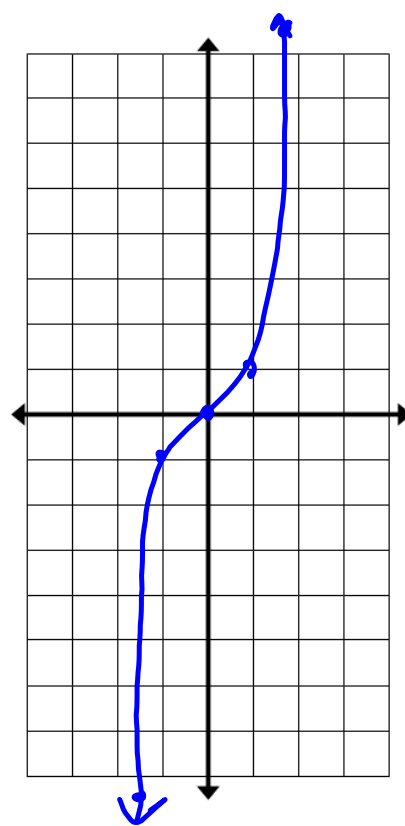
- DOMAIN:

\mathbb{R}

- RANGE:

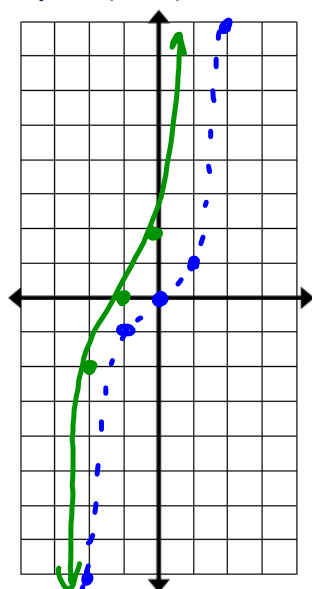
$(-\infty, \infty)$

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



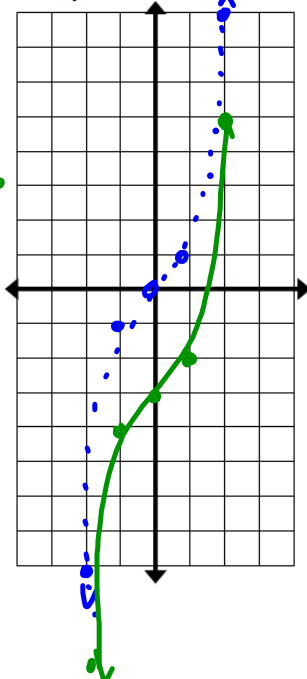
Examples: Graph the following graphs and state the transformations.

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

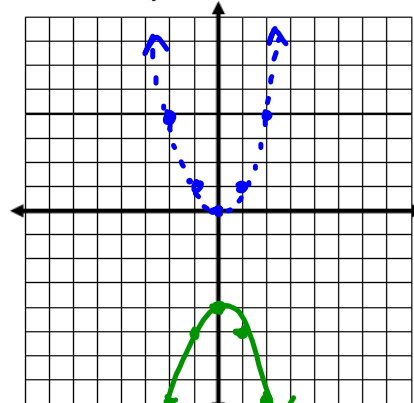


y	x	
-2	-8	-16
-1	-1	-2
0	0	0
1	1	2
2	8	16

2. $y = x^3 - 3$



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



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

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

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

$f(x)$

4. $y = -(x-3)^3$

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

5. $y = -\frac{1}{6}x^2 - 2$

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

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