SM 3H

Date: **Section:**

Objective:

What are the 4 types of transformations?

1.

2.

3.

4.

Combining transformations -Transformations may be performed in succession – one after another. Pay attention to the order of the transformations….it makes a difference.

When graphing a transformed graph *based on the equation of the function,* apply transformations in the following order:

1.

2.

3.

General transformation equation in function notation:

Examples: List the transformations in the appropriate order:

Parent graph: $y=\sqrt{x}$

a) $y=-\frac{1}{2}\sqrt{x+3}$

b) $y=\sqrt{-2x+9}$

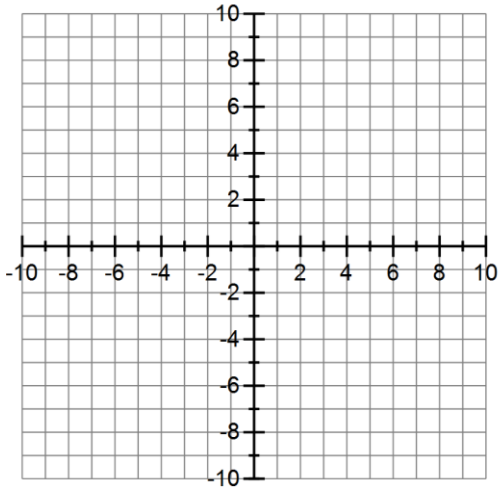
Parent graph: $f\left(x\right)=\left|x\right|$

a) $f\left(x\right)=-\left|\frac{x}{3}+2\right|$

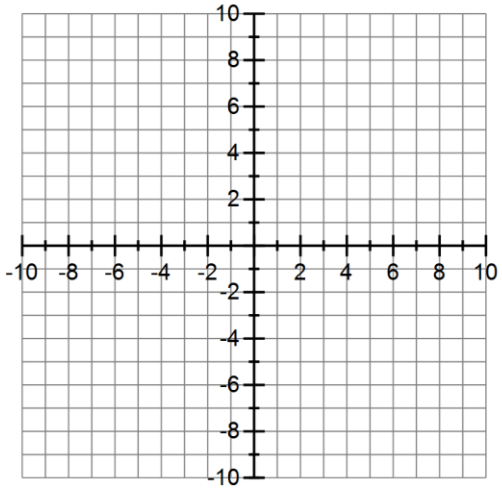
b) $f\left(x\right)=-\left|x+5\right|-3$

Examples: Name the parent graph. Describe how the graph is transformed. Graph the equation using 5 key points:

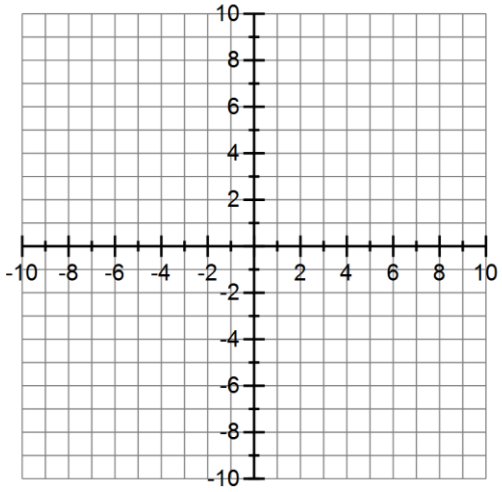
a) $f(x)=(x-1)^3+2$



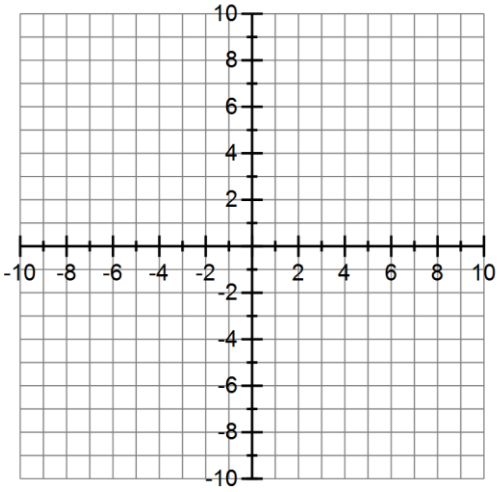
b) $g(x)=2|x+1|-3$



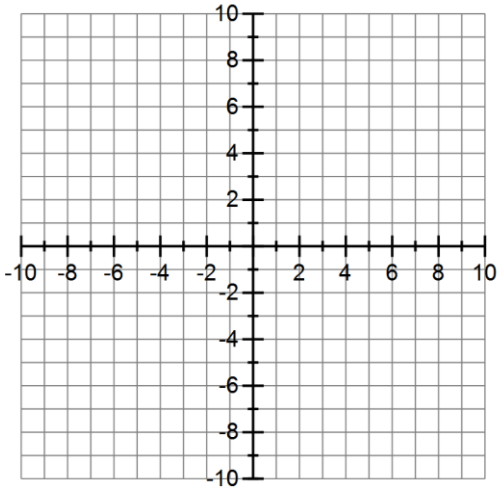
c) $f(x)=\sqrt{-(x-3)}+2$



d) $g(x)=-\sqrt[3]{2x}$



e) $h(x)=\dfrac{3}{(x+2)}$



Summary of Graphing Transformations:

To Graph:	Draw the Graph of $y = f(x)$ and:	Functional Change to $y = f(x)$:
Reflection About the *x*-axis		
$y = -f(x)$	Reflect the graph of f about the x-axis.	Multiply $f(x)$ by –1.
Reflection About the *y*-axis		
$y = f(-x)$	Reflect the graph of f about the y-axis.	Replace x by $-x$.
Vertical Stretches & Compressions		
$y = af(x),\ a > 0$	Multiply each y-coordinate of $y = f(x)$ by a. This stretches the graph of f vertically if $a > 1$. This compresses the graph of f vertically if $0 < a < 1$.	Multiply $f(x)$ by a.
Horizontal Stretches & Compressions		
$y = f(bx),\ b > 0$	Divide each x-coordinate of $y = f(x)$ by b. This stretches the graph of f horizontally if $0 < b < 1$. This compresses the graph of f horizontally if $b > 1$.	Replace x by bx.
Vertical Shifts		
$y = f(x) + k,\ k > 0$	Raise the graph of f by k units.	Add k to $f(x)$
$y = f(x) - k,\ k > 0$	Lower the graph of f by k units.	Subtract k from $f(x)$
Horizontal Shifts		
$y = f(x - h),\ h > 0$	Shift the graph of f to the right by h units.	Replace x by $x - h$.
$y = f(x + h),\ h > 0$	Shift the graph of f to the left by h units.	Replace x by $x + h$.

EXAMPLE: Describe a basic graph and a sequence of transformations that can be used to produce a graph of the given function.

a) $y = -2\sqrt{x+3}$

EXAMPLE: A new graph is obtained from the series of transformations on the given graph; write the equation for the new graph.

a) Starting with $y = \sqrt{x}$, reflect across the x-axis, vertical stretch by factor of 2, and shift left 3.

b) Starting with $y = x^2$; a vertical stretch by a factor of 4, then a shift right 6 units.