KEY

Name: ______________________ Date: __________ Period: __________

2.6 Transformations a, h, k

All of the different transformations of a function make up the rest of the family of functions. Take any parent function, f(x), the transformations create new functions which have similar structure as the parent but may be flipped, moved, or dilated.

General Function Notation: $f(x) \to af(x-h)+k$

a	h	k
Vertical reflection: *(over the x-axis)* when a is negative Vertical stretch: $\lvert a \rvert > 1$ greater than 1 Vertical shrink: $\lvert a \rvert < 1$ less than 1	Shift left: $(x+h)$ Shift right: $(x-h)$	Shift up: $+k$ Shift down: $-k$

Note: $f(-x)$ is a <u>horizontal reflection over the y-axis</u>:

We can talk about transformations using function notation. Describe the transformations of the function, f(x).

Example 1: $g(x) = 1f(x-1)-3$	Example 2: $h(x) = \overset{a}{-3}f(x) \overset{k}{+2}$	Example 3: $p(x) = \overset{a}{\frac{2}{3}}f\overset{h}{(x+6)}$
right 1 unit down 3 units	reflects over x-axis vertical stretch of 3 up 2 units	vertical shrink of $\frac{2}{3}$ left 6 units

We can talk about transformations when giving the equation of a function. State what the parent function for the equation and then describe the transformations of the parent function.

Example 4: a h k

$y = 3\sqrt{x-7}+1$

Parent function: $y = \sqrt{x}$
square root
Transformation(s):
vertical stretch of 3
right 7 units
up 1 unit

Example 5: a h

$y = -\frac{1}{2}(x+3)^3$

Parent function: $y = x^3$
cubic
Transformation(s):
reflects/flips over x-axis
left 3 units
vertical shrink of $\frac{1}{2}$

Example 6: a h k

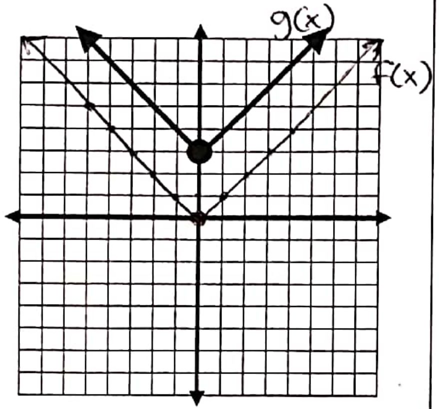
$y = 3(2)^{x+1}-5$

Parent Function: $y = 2^x$
exponential
Transformation(s):
vertical stretch of 3
left 1 unit
down 5 units

We can talk about transformations when giving a graph of the function if we compare it to its parent function. Describe the transformations from f(x) to g(x). Remember f(x) is the parent function. Attempt to write the equation based on the transformations.

- Graphs are approximately drawn to scale.
- There are no vertical shrinks or stretches from the parent function.
- Focus on the important point/features of each function based on its parent function.

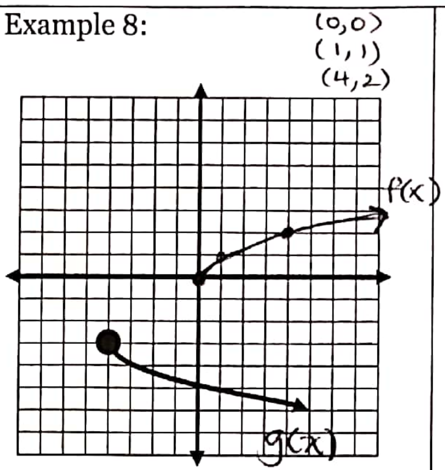
Example 7:



Transformation(s):
up 3 units

Equation: ____________________

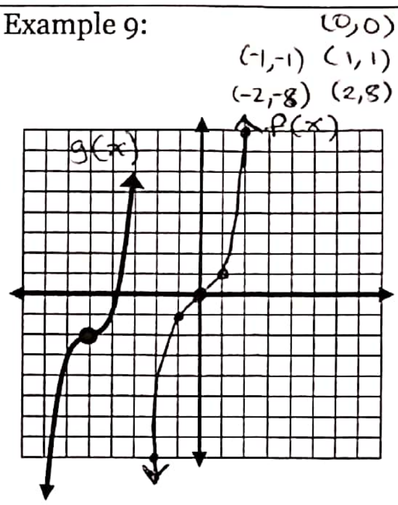
Example 8:



Transformation(s):
flip over x-axis
left 4 units
down 3 units

Equation: ____________________

Example 9:



Transformation(s):
left 5 units
down 2 units

Equation: ____________________