

Transformations Lesson #8: Combining Transformations - Part Two

Equations Combining Two or More Transformations

ie. $f(-x+2)$
 $f(-(x-2))$

To apply a combination of transformations, consider the following:

$y = a f[b(x - h)] + k$ where

ie. $f(2x+4)$
 $f(2(x+2))$

$|a|$ is the vertical stretch factor. If a is negative, there is also a reflection in the x -axis

$\frac{1}{|b|}$ is the horizontal stretch factor. If b is negative, there is also a reflection in the y -axis.

h is the horizontal translation where

- if $h > 0$, the translation is to the right
- if $h < 0$, the translation is to the left.

k is the vertical translation where

- if $k > 0$, the translation is k units up
- if $k < 0$, the translation is k units down.



When graphing a combination of transformations from an equation, use the following order:

- Step 1: Sketch the original function.
- Step 2: Sketch any stretches.
- Step 3: Sketch any reflections.
- Step 4: Sketch any translations.



The graph of $y = f(x)$ is shown.

Consider the function defined by the equation

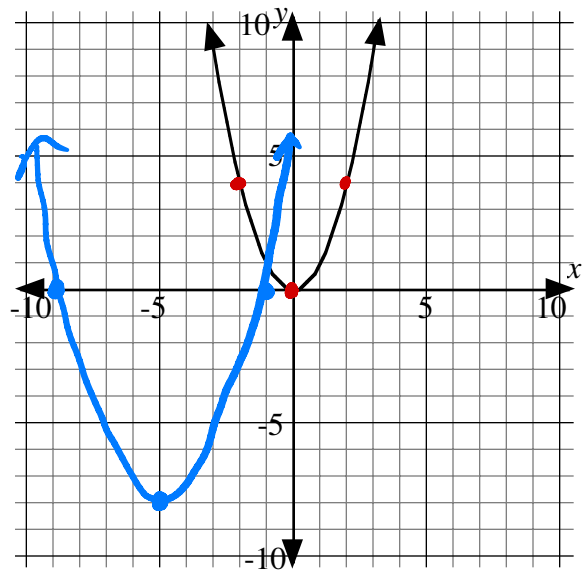
$y = 2f\left(\frac{1}{2}(x + 5)\right) - 8.$

- a) If the equation is written in the form $y = af[b(x - h)] + k$, state the values of $a, b, h,$ and k .

$a=2 \quad b=\frac{1}{2} \quad h=-5 \quad k=-8$

- b) Write the transformations associated with the parameters $a, b, h,$ and k .

$a=2$ vert. exp by a factor of 2
 $b=\frac{1}{2}$ hor. exp. by a factor of 2
 $h=-5$ hor. trans. 5 units left
 $k=-8$ vert. trans 8 units down.



$(x, y) \rightarrow (2x-5, 2y-8)$
* mapping *

- c) Put these transformations in an order which can be used to sketch the graph of the function. Sketch the graph of the function.



A function $G(x) = x^3$ is transformed into a new function $P(x)$. To form the new function $P(x)$, $G(x)$ is stretched vertically about the x -axis by a factor of 0.25, reflected in the y -axis, and translated 3 units to the right. Write the equation of the new function $P(x)$.

"x"

$$(x, y) \rightarrow (-x + 3, 0.25y)$$

graphing.

"y"

$$y \rightarrow 4y$$

$$x \rightarrow -(x-3)$$

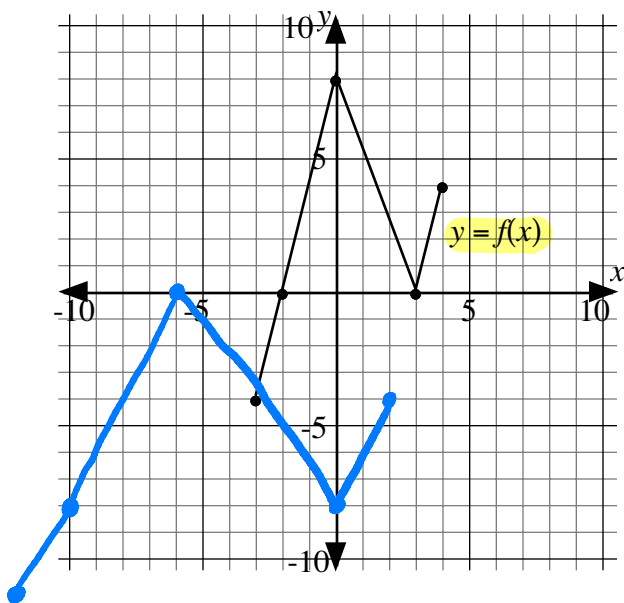
$$4y = (-x)^3$$

$$y = \frac{1}{4}(-x-3)^3$$



Given the graph of $y = f(x)$, sketch the graph of the transformed function $y = f\left(\frac{1}{2}x + 3\right) - 8$.

Hint: Rewrite this function in the form $y = a[f(b(x-h) + k)]$.



$$y = f\left(\frac{1}{2}\left(\frac{x+6}{x}\right)\right) - 8$$

$$(x, y) \rightarrow (2x-6, y-8)$$



The function $f(x) = \sqrt{x}$ has been transformed into the function $g(x) = -2\sqrt{3x-12} + 5$. Complete the following statement.

“ The function $f(x)$ has been transformed to the function $g(x)$ by stretching horizontally about the y -axis by a factor of _____, stretching vertically about the x -axis by a factor of _____, reflecting in the _____, translating _____ units up and _____ units horizontally to the _____ .”

Complete Assignment Questions #1 - #11

#1-6