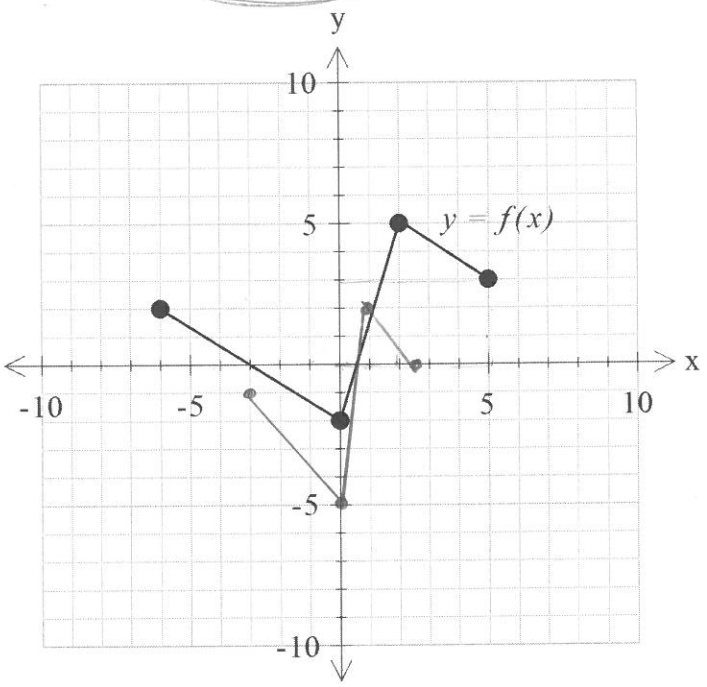
$(x, y) \longrightarrow \left(\frac{x}{b} + h, ay + k\right)$

Lesson 3: Combinations of Transformations

Example 1: Given the graph of $y = f(x)$. Sketch its image after a horizontal compression by a factor of $\frac{1}{2}$, then a translation of 3 units down. Write the equation of the new function in terms of $f(x)$.

(x, y)	$\left(\frac{1}{2}x, y - 3\right)$
$(-6, 2)$	$(-3, -1)$
$(0, -2)$	$(0, -5)$
$(2, 5)$	$(1, 2)$
$(5, 3)$	$(2.5, 0)$



$y - k = a\, f(b(x - h))$

$y - -3 = f(2x)$

$y + 3 = f(2x)$

Example 2:

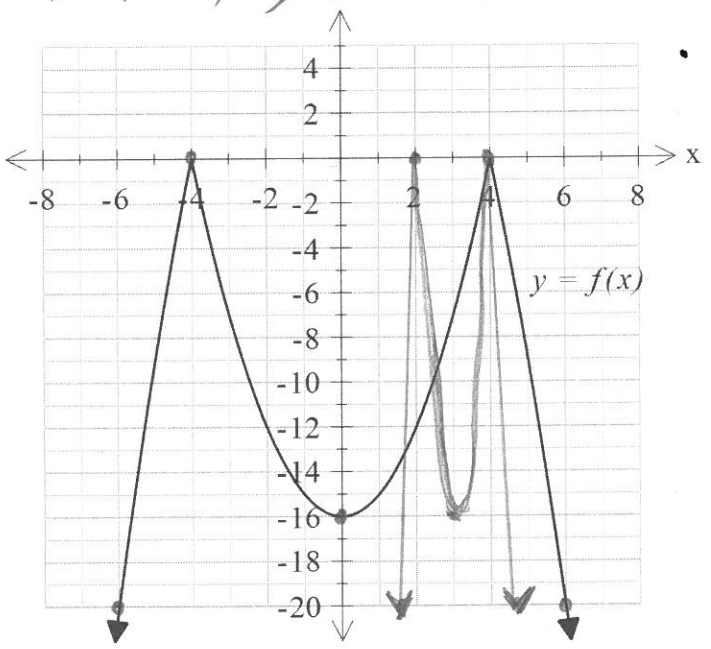
Given the graph of $y = f(x)$. Describe and sketch the graph of the transformations represented by $y = f(4(x - 3))$.

$b = 4$: factor is 1/4 Horizontal Compression

more 3 units right.

D: $(-\infty, \infty)$ R: $(-\infty, 0]$

(x, y)	$\left(\frac{1}{4}x + 3, y\right)$
$(-4, 0)$	$(2, 0)$
$(-6, -20)$	$(1.5, -20)$
$(0, -16)$	$(3, -16)$
$(4, 0)$	$(4, 0)$
$(6, -20)$	$(4.5, -20)$



$f(x) = \frac{1}{x}$

Example 3:

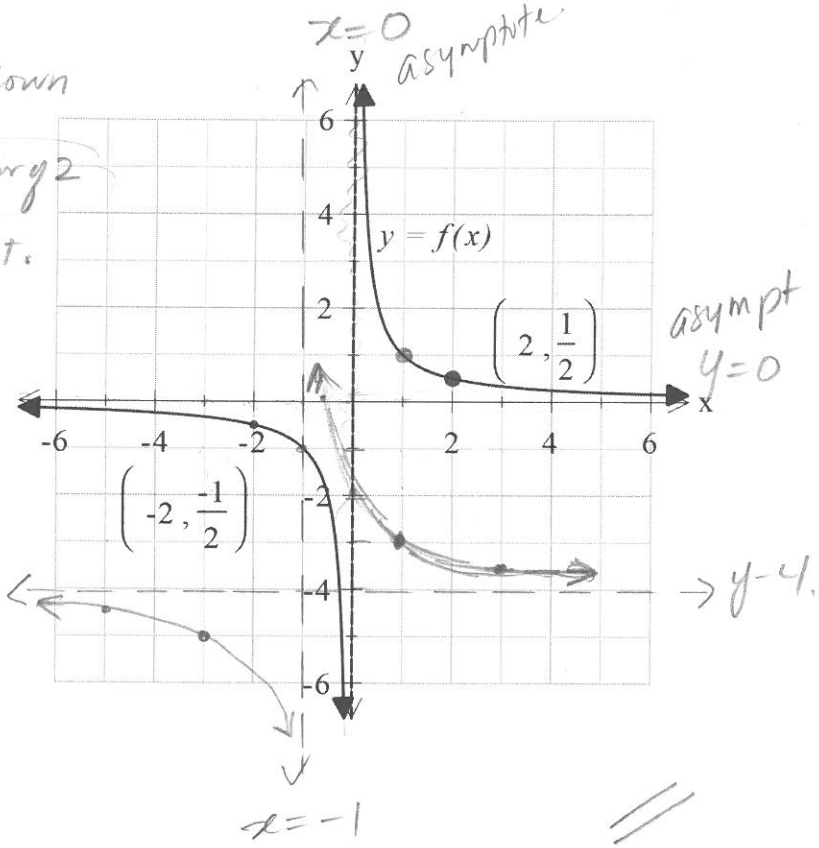
Given the graph of $y = f(x)$. Describe and sketch the graph of the transformations represented by $y + 4 = f(\frac{1}{2}(x + 1))$.

Vertical translation 4 units down

horizontal stretch by a factor of 2

Horizontal translation 1 left.

(x, y)	$(2x - 1, y - 4)$
$(1, 1)$	$(1, -3)$
$(2, \frac{1}{2})$	$(3, -3.5)$
$(-1, -1)$	$(-3, -5)$
$(-2, -\frac{1}{2})$	$(-5, -4.5)$



Example 4:

Given the graph of $y = \sqrt{x}$. Describe and sketch the graph of the transformations represented by $y - 2 = -\sqrt{3x + 3}$.