Combinations of Transformations

Given each of the following functions, explain how the first function relates to the second function.

$y = x^2$ $\qquad$ $y = \left(\frac{1}{2}(x-4)\right)^2$

* Always work from left to right when describing our transformations.

- horizontal expansion by a factor of 2.
- translation of 4 units right.

$y = \frac{1}{x}$ $\qquad$ $y = \frac{1}{2(x+3)} = \left(\frac{1}{2}\right)\frac{1}{(x+3)}$

- Vertically Compression by a factor of $\frac{1}{2}$.
- translates 3 units left.

$y = \sqrt{x}$

$y = -\sqrt{2x-6}$

The coefficient on "x" MUST be 1 before you describe any transformations.

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

- reflection in the x-axis
- horizontally compresses by a factor of $\frac{1}{2}$.
- translation of 3 units right.

$y = |x|$

$y = \left|\frac{-2}{3}x + 6\right|$

$y = \left|-\frac{2}{3}(x-9)\right|$

- reflected in y-axis
- horizontal expansion by a factor of $\frac{3}{2}$
- translated right 9 units.

When we combine translations, reflections and stretches, we need to perform the transformations in the following order:

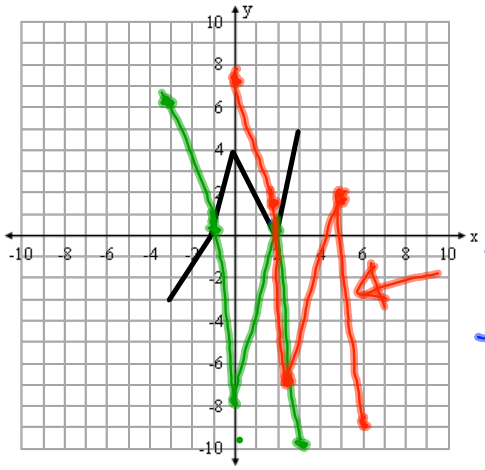
a) Sketch the NORMAL graph.

b) Apply any vertical, then horizontal expansions or compressions.

c) Perform any reflections

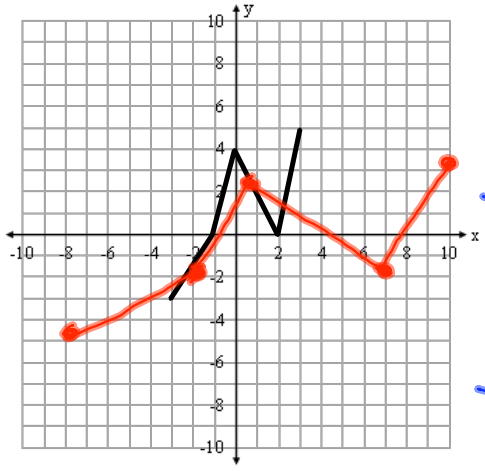
d) Perform any translations.

For each grid you are given a function. Sketch the graph of the new function using the given equation.



y = -2 f(x - 3) + 1

- vertical expansion by a factor of 2.
- reflection in the x-axis.
- translate right 3 and up 1 unit.



$$f(x) = \left(\frac{1}{3}(x-1)\right) - 2$$

- horizontal expansion by a factor of 3
- translate 1 unit right and 2 units down.