Warm Up 9/12

Lesson 2-4: Transformation of Functions III

Objective
Students will…
- Be able to apply the properties of <u>stretch and compression</u> in graphing various functions.
- Be able to determine the scale factor of the stretch or compression.

Transformation of Functions
Let's go ahead and compare the two functions: $f(x) = x^2$ and $g(x) = 2x^2$

Let's go ahead and compare the two functions: $f(x) = x^2$ and $g(x) = \frac{1}{2}x^2$

Transformation: Stretch and Compression
As observed, the transformation that took place was a _____ **stretch or a compression** by a certain **scale factor**. This can be generalized by the following:
For $y = cf(x)$

        If   , _____ the graph of $y = f(x)$ vertically by a factor of c.

        If   , _____ the graph of $y = f(x)$ vertically by a factor of c.

Transformation of Functions
Now let's go ahead and compare the two functions: $f(x) = x^2$ and $g(x) = (2x)^2$

Now let's go ahead and compare the two functions: $f(x) = x^2$ and $g(x) = \left(\frac{1}{2}x\right)^2$

Transformation: Stretch and Compression
As observed, the transformation that took place was a _____ **stretch or a compression** by a certain **scale factor**. This can be generalized by the following:
For $y = f(cx)$

        If   , _____ the graph of $y = f(x)$ horizontally by a factor of $\frac{1}{c}$

        If   , _____ the graph of $y = f(x)$ horizontally by a factor of $\frac{1}{c}$

Note the _____ **relationship** of the scale factor between vertical and horizontal stretch/compression.

Examples
Determine whether the function has a vertical or a horizontal stretch/compression, and determine its scale factor.

a. $f(x) = 3x^2$

b. $f(x) = \left(\frac{1}{2}x\right)^3$

c. $h(x) = \frac{3}{4}(x-1)^{19}$

d. $p(x) = \sqrt{3x}$

e. $f(x) = \frac{5}{4}|x|$

f. $q(x) = \frac{8}{5}\sqrt[6]{x-1}$

g. $u(x) = \frac{10}{11}(x-990)^5$

h. $t(x) = 3\sqrt{\frac{7}{6}(x+5)}$

For the function given function f, write the equation for the final transformed graph, based on the description of the transformation done.

$\qquad f(x) = \sqrt[3]{x}$; shift 3 units to the left, stretch vertically by a factor of 5, and reflect in the x-axis.

Explain how the graph of g is obtained from the graph of f.
$f(x) = |x|$, $g(x) = 3|x| + 1$ $f(x) = |x|$, $g(x) = -|x+1|$