Algebra 2 Unit 1 worksheet: Stretches and compressions

Name _____ Date _____ Period _____

1. Each graph is a vertical stretch or compression of one of the parents $y = x^2$, $y = x^3$, $y = \sqrt{x}$ or $y = \dfrac{1}{x}$. Rewrite the rule in the form $y = a\,f(x)$, with f the parent, and name the move with its factor.

(a) $y = \dfrac{x^2}{5}$

(b) $y = \dfrac{3}{4x}$

(c) $y = \dfrac{\sqrt{x}}{0.25}$

(d) $y = \left(\dfrac{x}{3}\right)^3$

2. $g(x) = a\,f(x)$ for some number $a > 0$. Fill in the four blanks in the table, find a, and name the move from the graph of f to the graph of g.

x	-4	-1	0	2	5
$f(x)$	6	_____	-3	_____	10
$g(x)$	_____	2	_____	-6	4

3. The graph of $g(x) = ax^2$, with $a > 0$, is 18 units wide at height 27: its two points with $y = 27$ are 18 units apart.

(a) Find a and name the move from $y = x^2$.

(b) How wide is the graph of g at height 108?

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4. The graph of a function f is one unbroken curve with domain $-6 \le x \le 12$ and range $-2 \le y \le 5$. It passes through $(-6, 3)$, $(0, -2)$, $(6, 0)$ and $(12, 5)$. Let $g(x) = f(3x)$ and $k(x) = f\left(\frac{x}{2}\right)$.

(a) Name the move from the graph of f to the graph of g, and the move from the graph of f to the graph of k, each with its factor.

(b) Give the point of the graph of g and the point of the graph of k that each of the four points moves to. Which of the four points does not move, and why?

(c) Give the domain and range of g and of k.

5. Diego says: "$g(x) = 3x^3$ is $y = x^3$ stretched vertically by a factor of 3, so $g(x) > x^3$ for every x."

(a) Test Diego's claim at $x = -1$.

(b) Find every x for which $3x^3 > x^3$.

(c) Let f be any function and $a > 1$. Say exactly when $a\,f(x) > f(x)$, and describe what this means for points above, on and below the x-axis.

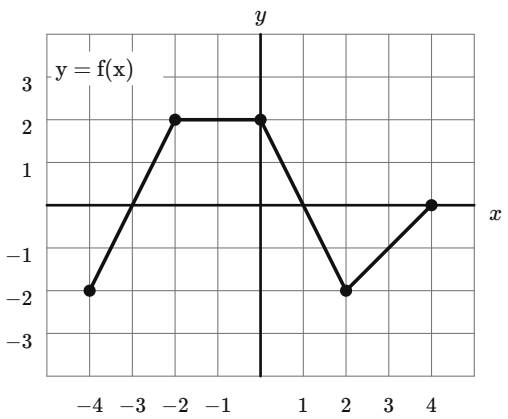
6. (a) $g(x) = 4f(x)$. Write $f(x)$ in terms of $g(x)$, and name the move that takes the graph of g back to the graph of f.

(b) Amara compresses $y = \sqrt{x}$ vertically by a factor of $\frac{1}{2}$, then stretches the new graph vertically by a factor of 6. Write the rule of her final graph and name it as one move of $y = \sqrt{x}$.

(c) A graph is stretched vertically by a factor of 5. What second vertical move makes the result the original graph compressed vertically by a factor of $\frac{1}{2}$?

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7. The figure shows the whole graph of $y = f(x)$: line segments with closed dots at the ends $(-4, -2)$ and $(4, 0)$. Let $g(x) = \frac{3}{2} f(x)$.



(a) Sketch the graph of g on the same grid, marking the images of the five marked points.

(b) Give the domain and range of f and of g.

(c) Which points of the graph of f are also on the graph of g? Explain why these and no others.

8. Maya draws the profile of a hiking trail for a park map. The true height of the trail above the trailhead is $h(d)$ meters at d meters along the trail (negative means below the trailhead). So that the hills show up, the profile plots $p(d) = 4h(d)$ instead of $h(d)$, with the same horizontal scale. These are heights read off her drawing:

d	0	200	400	600	800
$p(d)$	0	60	140	−20	0

(a) Name the move from the graph of h to the graph of p.

(b) Make a table of the true heights $h(d)$.

(c) At which listed points does the drawing show the true height? Why there?

(d) Find the average rate of change of p and of h from $d = 200$ to $d = 400$. How do the two compare?

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