

Math 12

Transformations: Stretches

Name: _____

Date: _____

Block: _____

Describe how the graphs of the following functions can be obtained from the graph of $y = f(x)$. Determine what the point (x, y) becomes.

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

4. $y = 5f(x)$

2. $4y = f(x-1)$

5. $y = \frac{1}{3}f\left(\frac{1}{4}x\right)$

3. $y = -\frac{1}{2}f(x)+1$

6. $y = f(3x-9)$

7. Describe the transformations that occur to:

a) $(3x)^2 + \left(\frac{y}{4}\right)^2 = 16$ compared to the graph of $x^2 + y^2 = 16$

b) $y = \sin 4x$ compared to the graph of $y = \sin x$

8. If the point $(-4, 9)$ is on the graph of $y = f(x)$, what point must be on the graph of:

a) $y = \frac{1}{3}f(2x)$

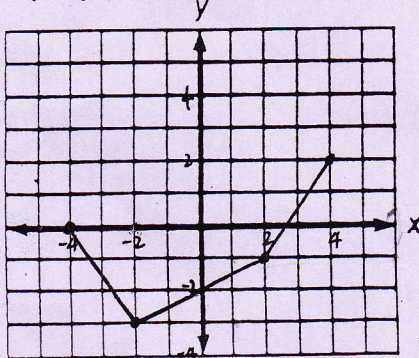
b) $y = -f\left(\frac{1}{3}x\right) + 2$

c) $y = 2f(4x-4)$

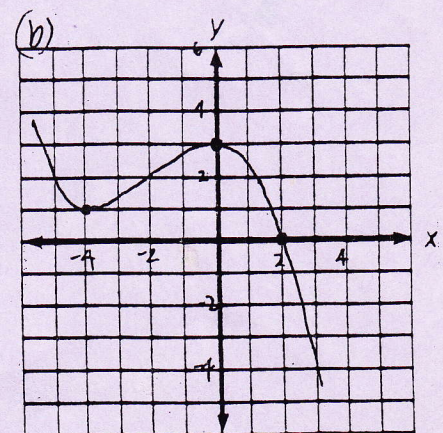
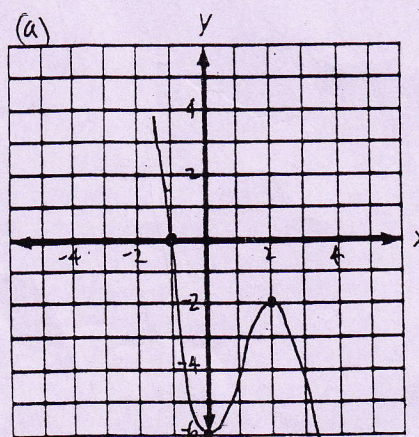
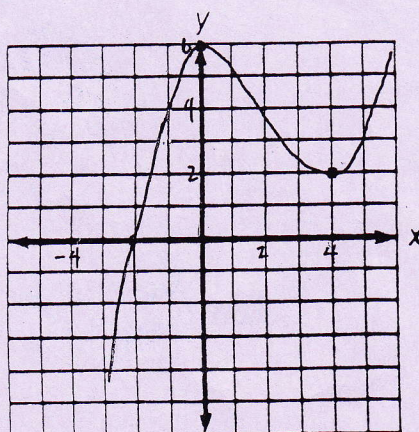
9. Given $y = f(x)$. Sketch the graph of:

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

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



10. Given $y = f(x)$. Determine an equation that represents the graph in diagram (a), and in diagram (b).



ANSWERS:

- 1) horizontal stretch by a factor of 2; $(x, y) \rightarrow (2x, y)$
- 2) vertical compression by $\frac{1}{4}$, horizontal right shift 1; $(x, y) \rightarrow (x+1, \frac{1}{4}y)$
- 3) vertical compression by $\frac{1}{2}$, vertical shift up 1, reflection in the x-axis
 $(x, y) \rightarrow (-x, -\frac{1}{2}y+1)$
- 4) vertical stretch by 5; $(x, y) \rightarrow (x, 5y)$
- 5) horizontal stretch by 4, vertical compression by $\frac{1}{3}$; $(x, y) \rightarrow (4x, \frac{1}{3}y)$
- 6) horizontal compression by $\frac{1}{3}$, horizontal right shift 3; $(x, y) \rightarrow (\frac{1}{3}x+3, y)$
- 7) $(3x)^2 + (\frac{y}{4})^2 = 16$ Horizontal compression by $\frac{1}{3}$
Vertical stretch by 4
- 8) a) $(-2, 3)$ b) $(-12, -7)$ c) $(0, 18)$
- 10) a) $y = -f(2x)$ b) $y = \frac{1}{2}f(-x)$