Name:_____ Date:_____

Pre Calculus 12: Section 1.4 Expansions and Compressions of Functions

1. When a function is expanded vertically, what happens to the X and Y coordinates? Explain

2. When a function is compressed vertically, what happens to the X and Y coordinates? Explain

3. When a function is expanded horizontally, what happens to the X and Y coordinates? Explain

4. When a function is compressed horizontally, what happens to the X and Y coordinates? Explain

5. Given the transformation $y = f(x) \rightarrow y = f(kx)$, for what values of "k" will the function be expanded horizontally?

6. Given the transformation $y = f(x) \rightarrow y = f(kx)$, for what values of "k" will the function be compressed horizontally?

7. Given the transformation $y = f(x) \rightarrow k \times y = f(x)$, for what values of "k" will the function be expanded vertically?

8. Given the transformation $y = f(x) \rightarrow y = \frac{1}{k} \times f(x)$, for what values of "k" will the function be compressed vertically?

9. Indicate the transformations from the function on the left to the function on the right. Indicate whether if it is a horizontal/vertical and compression/expansion. Also indicate how the "x" and "y" coordinates will be affected.

a) $y = |x| \rightarrow y = 3|2x|$

b) $y = \sqrt{x} \rightarrow y = \sqrt{4x}$

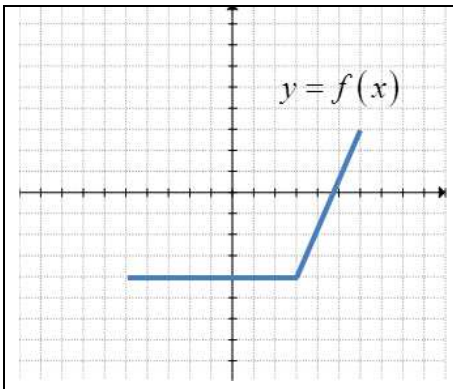
c) $y=\dfrac{1}{2x-3}\rightarrow y=\dfrac{3}{4x-3}$

d) $y=(x-3)^2\rightarrow y=\dfrac{1}{5}(2x-3)^2$

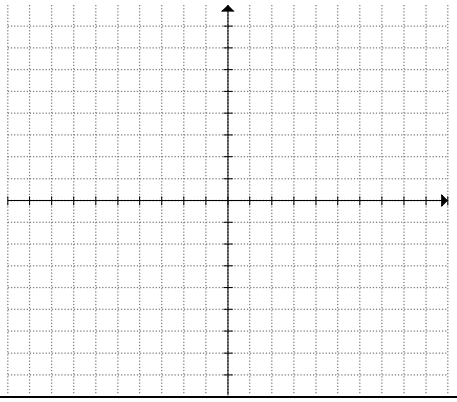
e) $y=x^3+x^2-5\rightarrow\dfrac{1}{3}y=(2x)^3+(2x)^2-5$

f) $y=2^{x+4}\rightarrow y=4\left(2^{x+4}\right)^3$

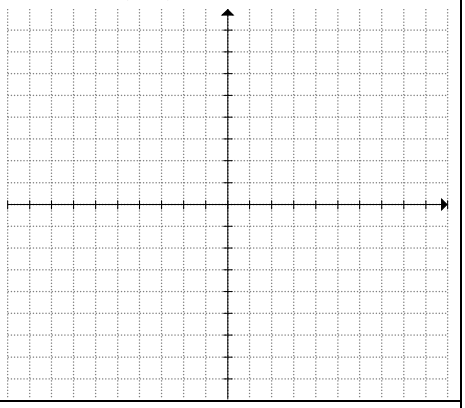
10. Given the graph of $y=f(x)$, draw the graph of the following:



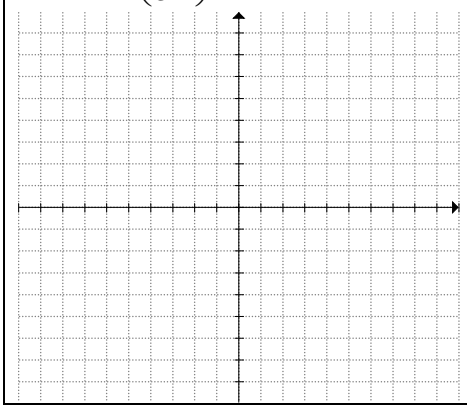
i) $y=2f(x)$



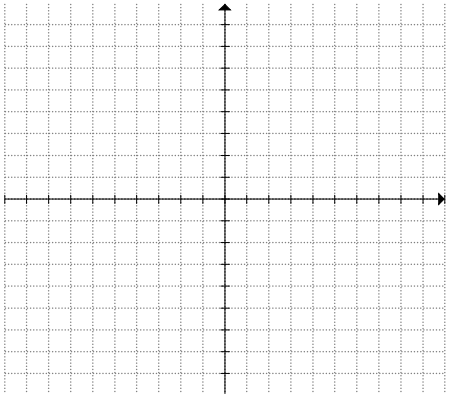
ii) $y=f(2x)$



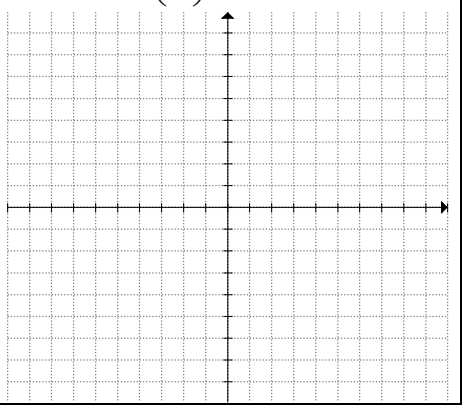
iii) $y=f\left(\dfrac{1}{3}x\right)$



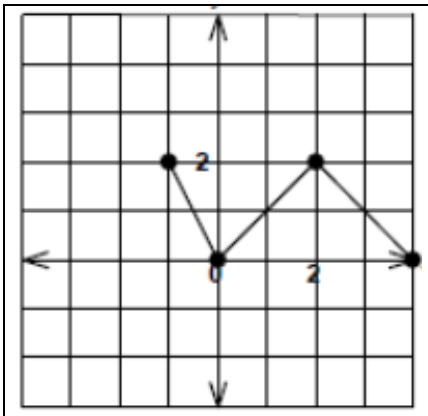
iv) $y=\dfrac{1}{4}f(x)+1$



v) $y=-3f\left(\dfrac{x}{2}\right)$



11. Given the graph of $y = f(x)$, draw the graph of the following:



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

ii) $y = \frac{2}{3} f\left(\frac{4x}{3}\right)$

iii) $y = 3f\left(\frac{x}{2}\right)$

iv) $2y = 3f(x) - 4$

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

12. If (a,b) is a point on the graph of $y = f(x)$, determine what this coordinate will become in each of the following functions below:

a) $y = \frac{2}{5} f(3x)$	b) $y = \frac{1}{2} f\left(\frac{4}{5}x\right)$
c) $y = -0.75 f(2x)$	d) $y = -1.25 f(x-3) - 2$

13. Given $y = f(x)$, indicate what the new equation will be after the transformations given in the order stated:

a) $f(x) = 2x + 3$	1. A horizontal expansion by a factor of 3 2. Then shifted up by 5 units
b) $f(x) = (x-3)^2 - 4$	1. A vertical compression by a factor of 0.5 2. A vertical reflection over the "X" axis 3. Shift of 6 units down
c) $f(x) = \sqrt{x+2} + 4$	1. A Reflection in the y-axis and 2. A Horizontal compression by a factor of 1/3. 3. A shifted 3 units left.
d) $f(x) = 2^x + 3$	1. A reflection in both the "x" and "y" axis 2. A horizontal expansion by a factor of 2, 3. A shifted of 11 units down
e) $x^2 + (y-1)^2 = 9$	1. A reflection in the "y" axis, 2. A Horizontal expansion by a factor of 2 and 3. A vertical compression by a factor of 0.5.

14. Given the equation $f(x) = \sqrt{3x-2}$, if we were to perform two transformations:

A) A horizontal compression by a factor of 0.5 B) A horizontal shift of 4 units right
What would the function look like if we performed "A" first and then "B"?

B) What would the function look like if we performed "B" first and then "A"?