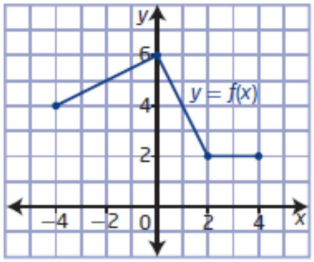
PreCalculus 12 Name_____

Date_____

1.3 Combining Transformations

Investigate – p. 33 – start with the graph of y = f(x):



Sketch the new graph after the transformations of reflection over the x-axis, then translating 4 units up, and also give the mapping notation.

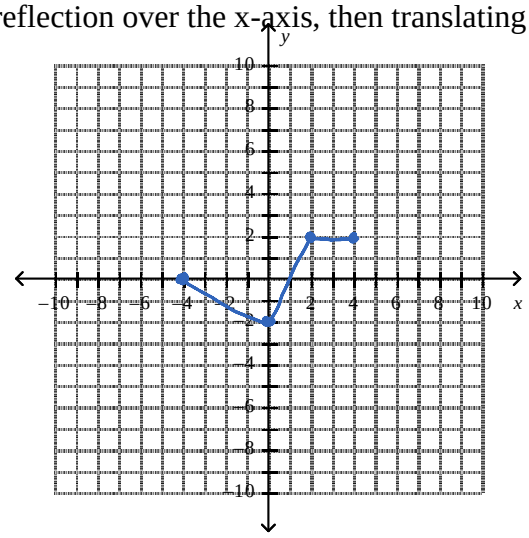
x	y
-4	4
0	6
2	2
4	2

→

x	y
-4	-4
0	-6
2	-2
4	-2

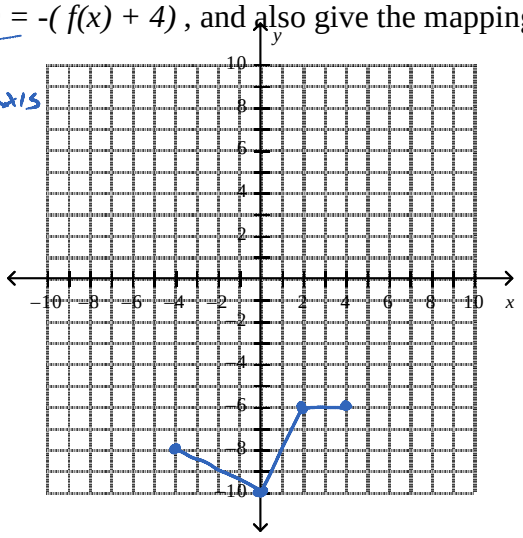
→

x	y
-4	0
0	-2
2	2
4	2



Sketch the new graph after the transformations $g(x) = -(f(x) + 4)$, and also give the mapping notation.

up 4, then reflect over x-axis



What do you notice? different graph!

Why was this not an issue with stretches and reflections?

reflections are stretches, and when multiplying by many factors, the order doesn't matter.

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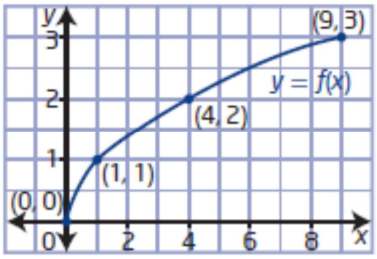
To accurately sketch the graph of a function $y-k=af\left(b\left(x-h\right)\right)$, the stretches and reflections (a, b) should be performed before the translations (h, k). Why? BEDMAS

Example 1: p. 34 - Use the graph of $y = f(x)$ to sketch:

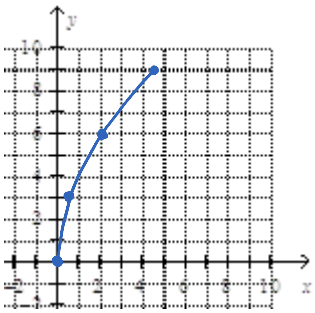


a) $y = 3f(2x)$

x	y
0	0
1	1
4	2
9	3

→

x	y
0	0
½	3
2	6
4½	9

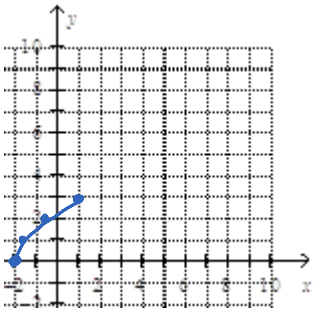


b) $y = f(3x + 6)$

$= f(3(x+2))$

must separate the two

⅓ as wide, then 2 left

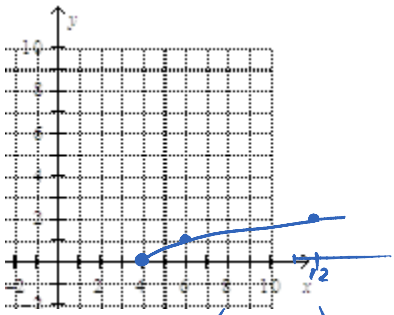


x	y
-2	0
$-1\frac{2}{3}$	1
$-\frac{2}{3}$	2
1	3

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

$= f\left(\frac{1}{2}(x-4)\right)$

Twice as wide, then 4 right



last point is (22, 3)

Example 2: Consider the transformations in $g(x)=-\frac{1}{2}f\left(2\left(x-4\right)\right)+1$

a) describe the transformations in the correct order

Vertical stretch by -½

Horizontal stretch by ½

4 right & 1 up

b) give the proper mapping notation

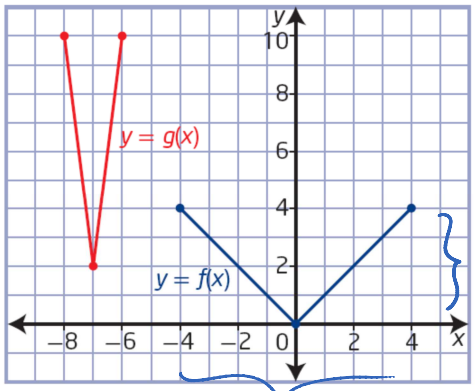
$(x, y) \rightarrow \left(\frac{1}{2}x+4, \frac{-1}{2}y+1\right)$

c) if $f(x)$ was defined as x^2, give the equation of the new $g(x)$ function

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

Example 3: p. 37 - If *f(x)* is the original graph, give the equation of the newly transformed graph *g(x)*.

a)

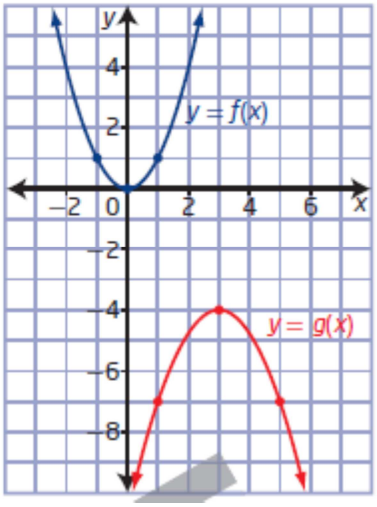


$g(x) = 2f(4(x+7)) + 2$

4 Tall becomes 8 Tall

8 wide becomes 2 wide

b)



$g(x) = -3f\left(\frac{1}{2}(x-3)\right) - 4$

Assignment: p. 38 # 1, 2, 4-7, 10, 11, 15, C3, C4