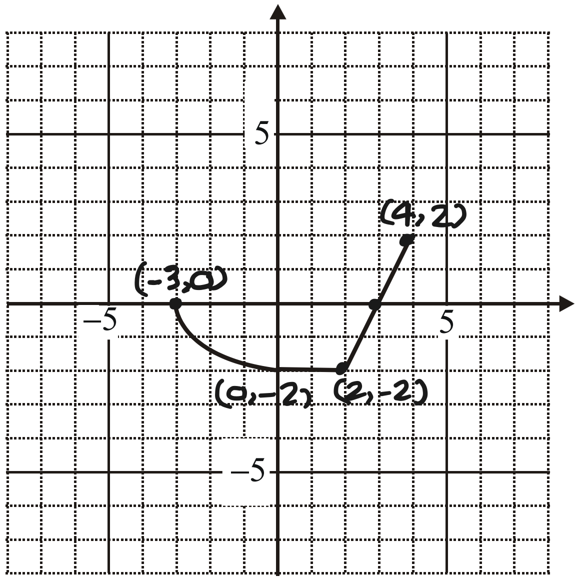
TRANSFORMATIONS – PRACTICE – A

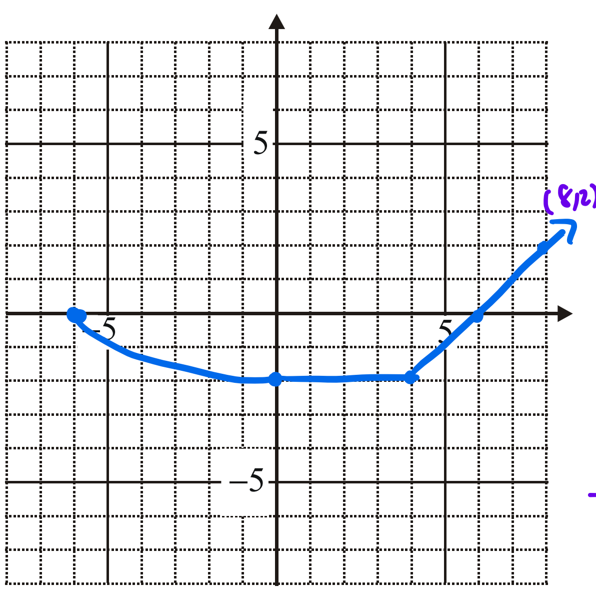
1. The function $y = f(x)$ is graphed below.

x	y	2x	y



a) Graph the function $y = f\left(\frac{1}{2}x\right)$ on the grid provided, and describe the changes made to $y = f(x)$. If the point $(4,2)$ is on the graph of $y = f(x)$, what point must be on the graph of $y = f\left(\frac{1}{2}x\right)$?

horizontal exp by factor of 2

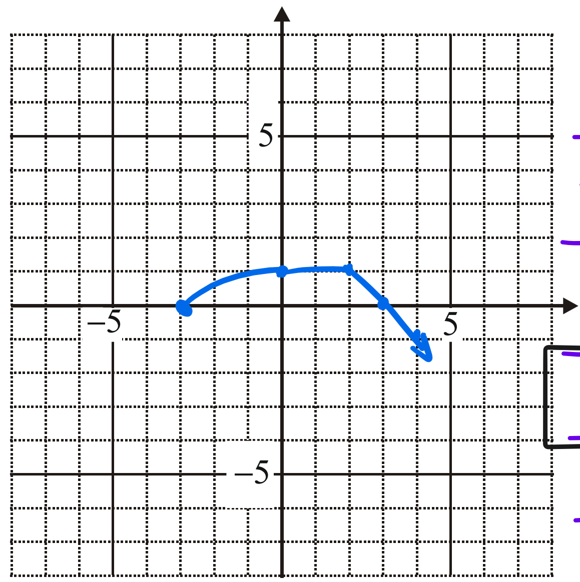


x	y	2x	y
-3	0	-6	0
0	-2	0	-2
2	-2	4	-2
3	0	6	0
4	2	8	2

$(4,2) \longrightarrow (8,2)$

1. b) Graph the function $y = -\frac{1}{2} f(x)$ on the grid provided, and describe the changes made to $y = f(x)$. If the point $(2, -2)$ is on the graph of $y = f(x)$, what point must be on the graph of $y = -\frac{1}{2} f(x)$?

Refeaction on x-axis
VC by $\frac{1}{2}$

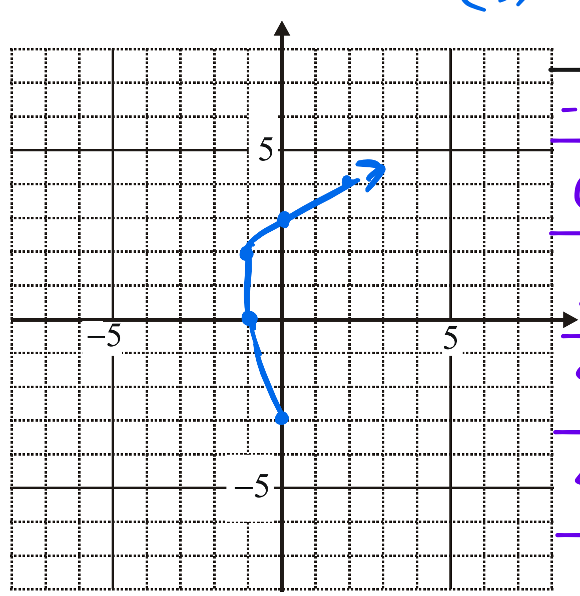


x	y	x	$-\frac{1}{2}y$
-3	0	-3	0
0	-2	0	1
2	-2	2	1
3	0	3	0
4	2	4	-1

$(2,-2) \Rightarrow (2,1)$

c) Graph the function $\boxed{x = f(y)}$ on the grid provided, and describe the changes made to $y = f(x)$. If the point $(-3, 0)$ is on the graph of $y = f(x)$, what point must be on the graph of $x = f(y)$? $(-3, 0) \Rightarrow (0, -3)$

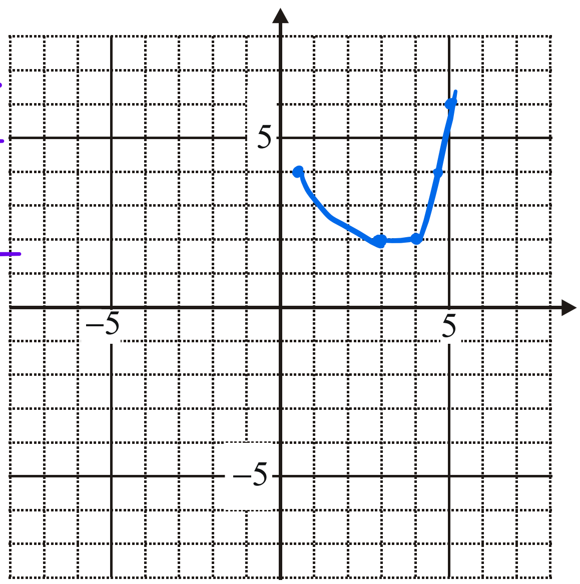
inverse



x	y	x(in)	y (in)
-3	0	0	-3
0	-2	-2	0
2	-2	-2	2
3	0	0	3
4	2	2	4

1. d) Graph the function $y = f(2x-6)+4$ on the grid provided, and describe the changes made to $y = f(x)$. If the point $(4,2)$ is on the graph of $y = f(x)$, what point must be on the graph of $y = f(2x-6)+4$?

x	y	$\frac{1}{2}x+3$	$y+4$
-3	0	1.5	4
0	-2	3	2
2	-2	4	2
3	0	4.5	4
4	2	5	6



$y = f(2[x-3])+4$

hc: by $\frac{1}{2}$

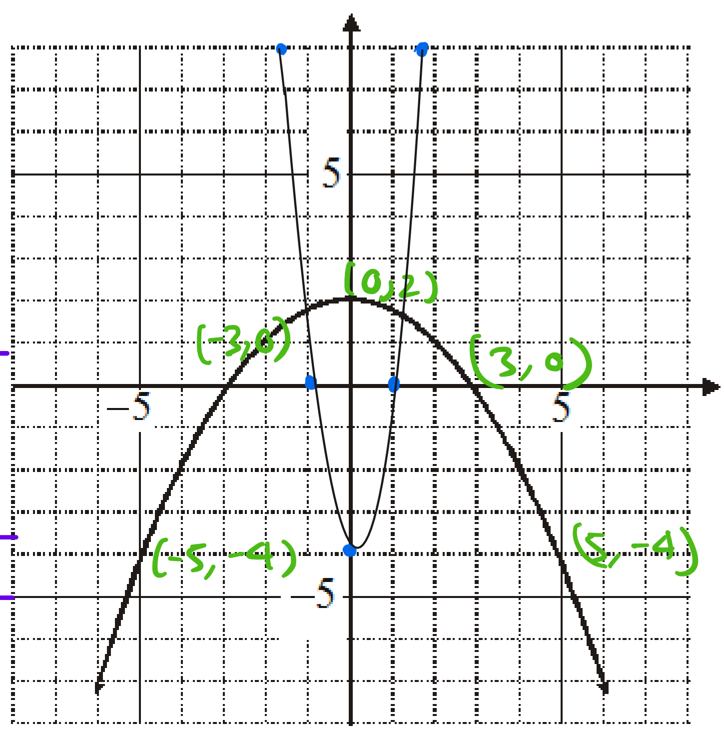
hs: Right +3

Vs: up +4

$(4,2) \Rightarrow (5,6)$

2. The function $y = f(x)$ is graphed below. On the same grid, sketch the graph of $y = -2f(3x)$.

x	y	$\frac{1}{3}x$	$-2y$
-5	-4	$-\frac{5}{3}$, -1.7	8
-3	0	-1	0
0	2	0	-4
3	0	1	0
5	-4	$\frac{5}{3}$, 1.7	8



VE: by factor of 2

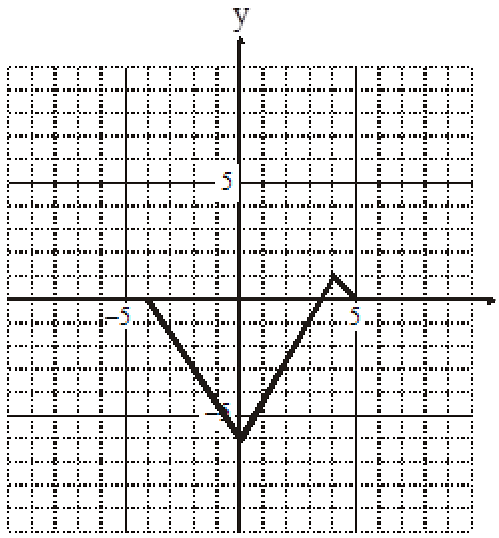
Reflection on x-axis

HC: by factor of $\frac{1}{3}$

3. Two functions, $y = f(x)$ and $y = f(a(x-b))$, are graphed below. Determine the values of a and b. $a=-1,\ b=-3$

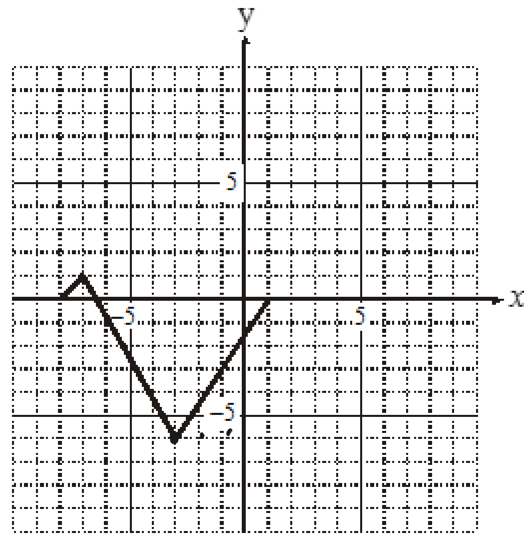
$y = f(-(x+3))$

$y = f(x)$



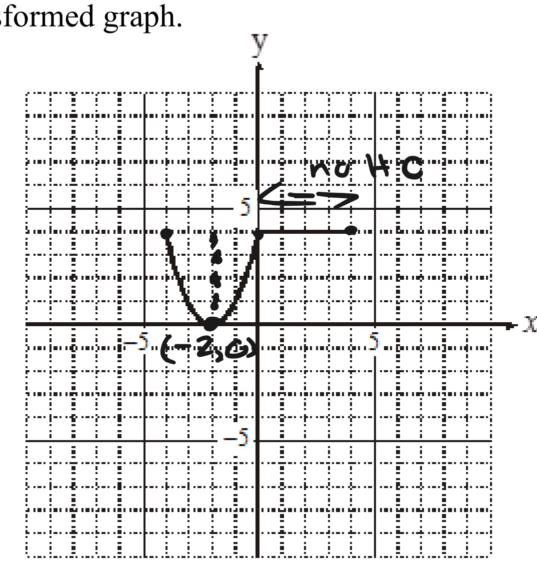
$y = f(a(x-b))$

$a=-1$
$b=-3$



4. The function $y = f(x)$ is graphed below. Sketches of various transformations of $y = f(x)$ are given in the following graphs. Write an equation in terms of $y = f(x)$ to represent each transformed graph.

x	y	xnew	ynew
-4	4		
-2	0		
0	4		
4	4		



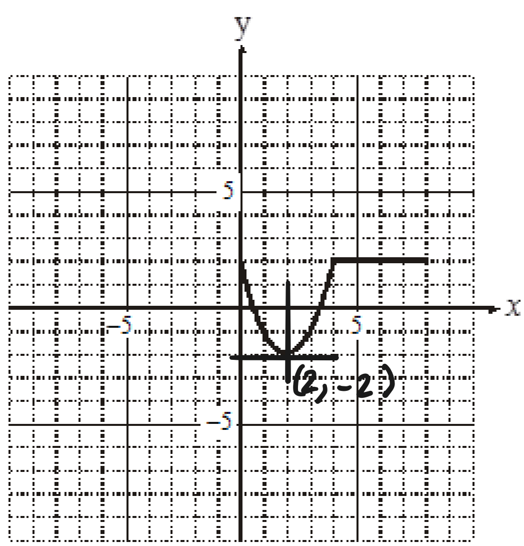
no horiz. comp
no vert comp
No reflection
only x & y shifts

(-4, 4)
0, 2

+ 4
minus 2 down

a)

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

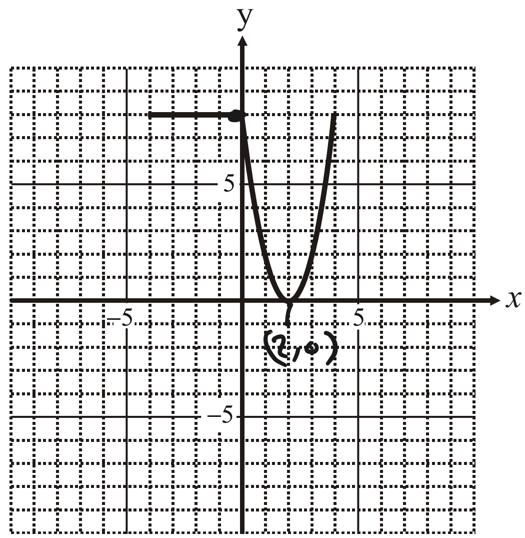


x	y	xnew	ynew
-4	4		
-2	0		
0	4		
4	4		

no horiz. comp
Vertical comp 2y
$x \to -x$

4. b)

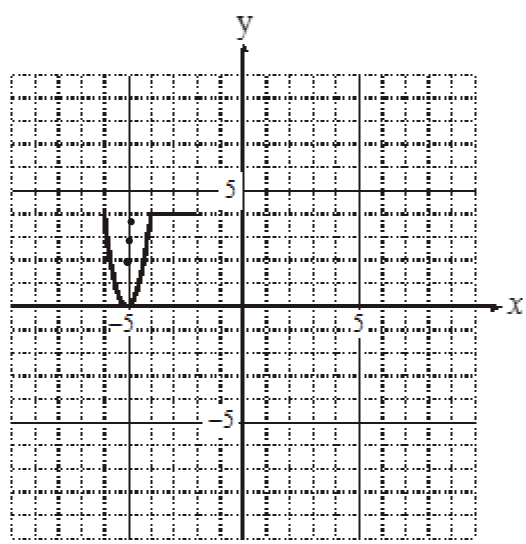
x	y	$-x$	2y
-4	4		
-2	0		
0	4		
4	4		



$y = 2f(-x)$

$(-2,0)$
$\downarrow$
$(2,0)$

c)



$\frac{-2}{2} = -1$

$(-2,0)$
$\downarrow$
$(-5,0)$

4, 4

HC: $\frac{1}{2}$ NO VC

$4,4 = -2, 4$

HS: +6

$y = f[2(x+4)]$

5. The function $y = 3x - 6$ has the following transformations applied to it. Determine an equation for each new function.

a) a vertical compression by a factor of $\frac{1}{3}$ followed by a translation 3 units right

b) a horizontal compression by a factor of $\frac{1}{4}$, then a reflections in the y-axis and a translation 2 units down

c) a horizontal expansion by a factor of 6 followed by a translation 4 units left and 5 units up

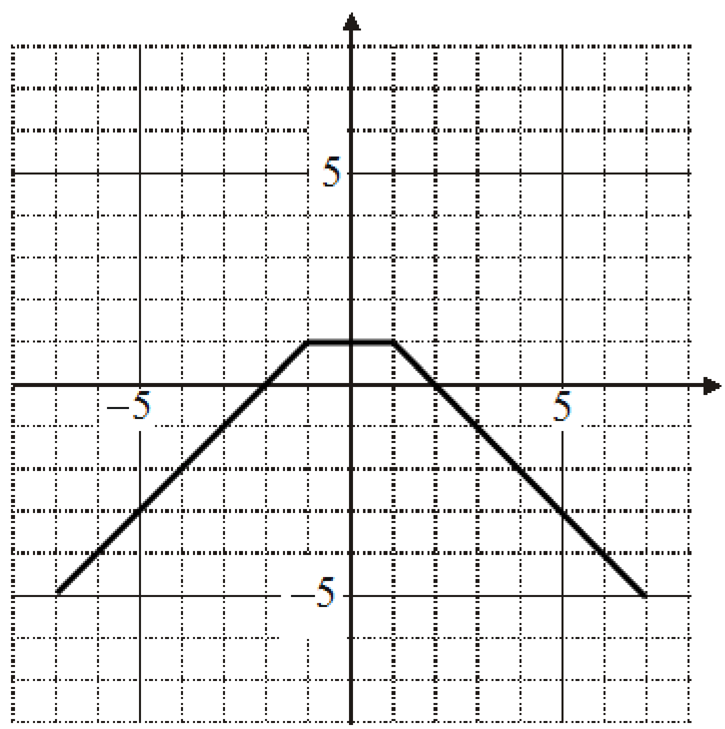
6. The function $y=\sqrt{16-x^2}$ has the following transformations applied to it. Determine an equation for each new function.

a) a horizontal compression by a factor of $\frac{1}{2}$

b) a vertical expansion by a factor of 3, then a reflection in the y-axis

7. If $f(x)=\frac{2-x}{5x}$, determine the equation of $f^{-1}(x)$, the inverse of $f(x)$.

8. Given the function $y=f(x)$ graphed below, determine the coordinates of all of the invariant points for each of the following transformations.



a) $y=f(-x)$

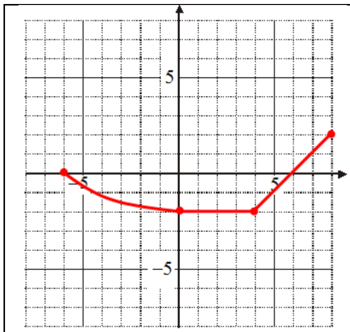
b) $y=-f(x)$

c) $x=f(y)$

9. The point $(8,-5)$ is on the graph of $y=f(x)$. Determine the coordinates of the corresponding point on the graph of $y=\dfrac{3}{|f(-x+1)-2|}+5$.

TRANSFORMATIONS – PRACTICE – A
ANSWERS

1. a)

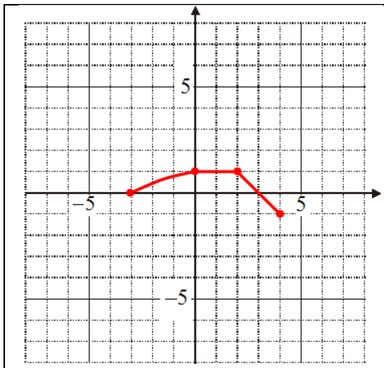


$y = f\left(\frac{1}{2}x\right)$

horizontal expansion by a factor of 2

$(4,2) \rightarrow (8,2)$

b)



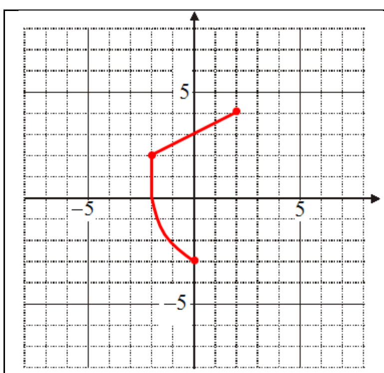
$y = -\frac{1}{2}f(x)$

reflection in the x-axis

vertical compression by a factor of $\frac{1}{2}$

$(2,-2) \rightarrow (2,1)$

c)

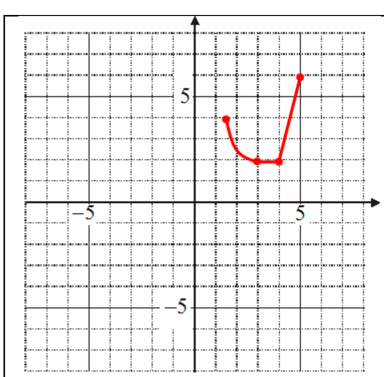


$x = f(y)$

reflection in the line $y = x$

$(-3,0) \rightarrow (0,-3)$

d)



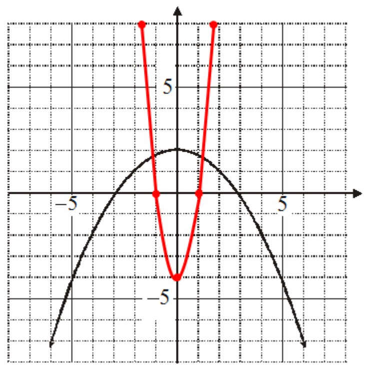
$y = f(2x-6)+4$

horizontal compression by a factor of $\frac{1}{2}$

translation 3 units right and 4 units up

$(4,2) \rightarrow (5,6)$

2. $y=-2f(3x)$



3. $a=-1$, $b=-3$

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

   b) $y=2f(-x)$

   c) $y=f\left[2(x+4)\right]$

5. a) $y=x-5$

   b) $y=-12x-8$

   c) $y=3\left[\frac{1}{6}(x+4)\right]-1$

6. a) $y=\sqrt{16-4x^2}$

   b) $y=3\sqrt{16-x^2}$

7. $f^{-1}(x)=\frac{2}{5x+1}$

8. a) $(0,1)$

   b) $(-2,0)$, $(2,0)$

   c) $(1,1)$

9. $\left(-7,\frac{38}{7}\right)$