

1.3

Combining Transformations

Focus on...

- sketching the graph of a transformed function by applying translations, reflections, and stretches
- writing the equation of a function that has been transformed from the function $y = f(x)$

BEDMAS

$$3 \times 5 \div 6 \times 2$$

↳ read left to right like
English language

Multiple transformations can be applied to a function using the general transformational model.

$$y - k = af(b(x - h))$$

or

$$y = af(b(x - h)) + k$$

VS a

HS $\frac{1}{b}$

V $T + k$

HT $+ h$

R_x in front of a

R_y in front of b

→ need to be in factored form to find transform.

$$\frac{1}{a}(y - k) = f(b(x - h))$$

Mapping Rule: $(x, y) \rightarrow \left(\frac{1}{b}x + h, ay + k \right)$

When sketching graphs of functions of the form $y - k = af(b(x - h))$ or $y = af(b(x - h)) + k$, the stretches and reflections should occur before translations.

Using the graph of $f(x)$, draw the transformed graph of

← Put in factored form

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

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

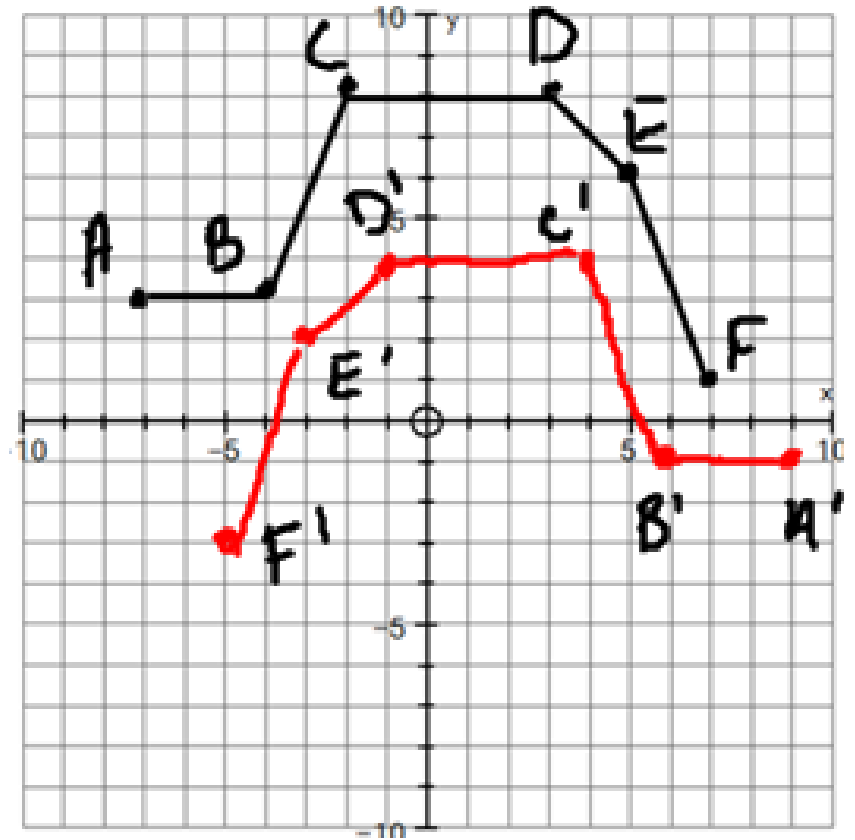
VS 1	HS 1
VT -4	HT +2
R_x None	R_y Yes

Mapping Rule

$$(x, y) \rightarrow (-x + 2, y - 4)$$

$$\frac{3x - 2}{-5} \rightarrow \frac{3x - 2}{-5}$$

$$\frac{3x - 2}{-5} \rightarrow \frac{3x - 2}{-5}$$



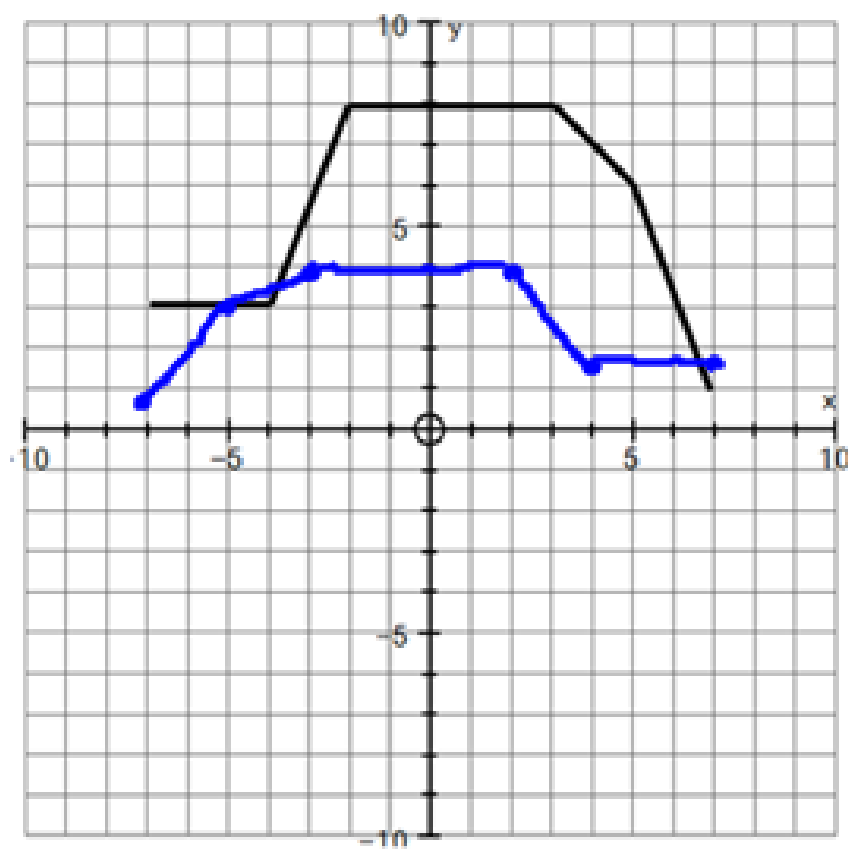
$$y = \frac{1}{2} f(-x)$$

VS $\frac{1}{2}$ HS 1
 VT 0 HT 0
 Rx No Ry Yes!!

$(x, y) \rightarrow (-x, \frac{1}{2}y)$

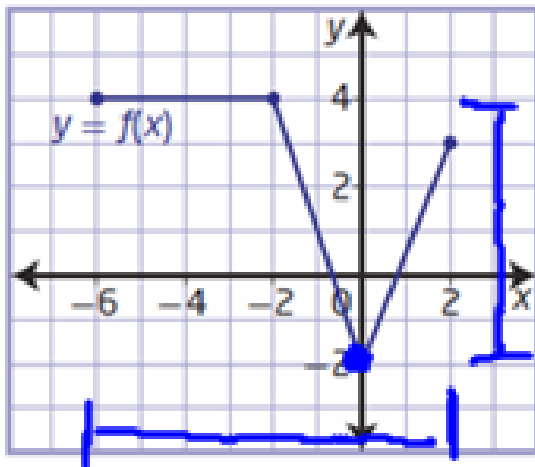
$\frac{1}{-6 \ 8 \ 8 \ 3 \ 3 \ 4 \ 7}$

$\frac{1}{-7 \ 2 \ 2 \ 4 \ 4 \ 5 \ 7}$
 1-2-3-4-5-6-7

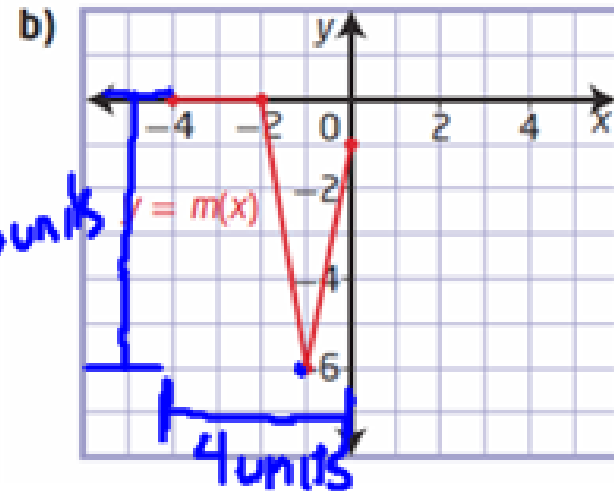


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4. Using the graph of $y = f(x)$, write the equation of each transformed graph in the form $y = af(b(x - h)) + k$.



8 units



VS 1 HS $\frac{1}{2}$

VT -4 HT -1

R_x No R_y No

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

6. The key point $(-12, 18)$ is on the graph of $y = f(x)$. What is its image point under each transformation of the graph of $f(x)$?

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



VS 1 HS 1
VT -6 HT 4
 R_x Nope R_y Nope

$$(x, y) \rightarrow (x + 4, y - 6)$$

$$(-12, 18) \rightarrow (-12 + 4, 18 - 6)$$
$$\rightarrow (-8, 12)$$

Your Turn

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Describe the combination of transformations that should be applied to the function $f(x) = x^2$ in order to obtain the transformed function $g(x) = -2f\left(\frac{1}{2}(x+8)\right) - 3$. Write the corresponding equation and sketch the graph of $g(x)$.

VS2

HS2

$$g(x) = -2\left[\frac{1}{2}(x+8)\right]^2 - 3$$

VT-3

HT-8

Rx Yes

Ry No

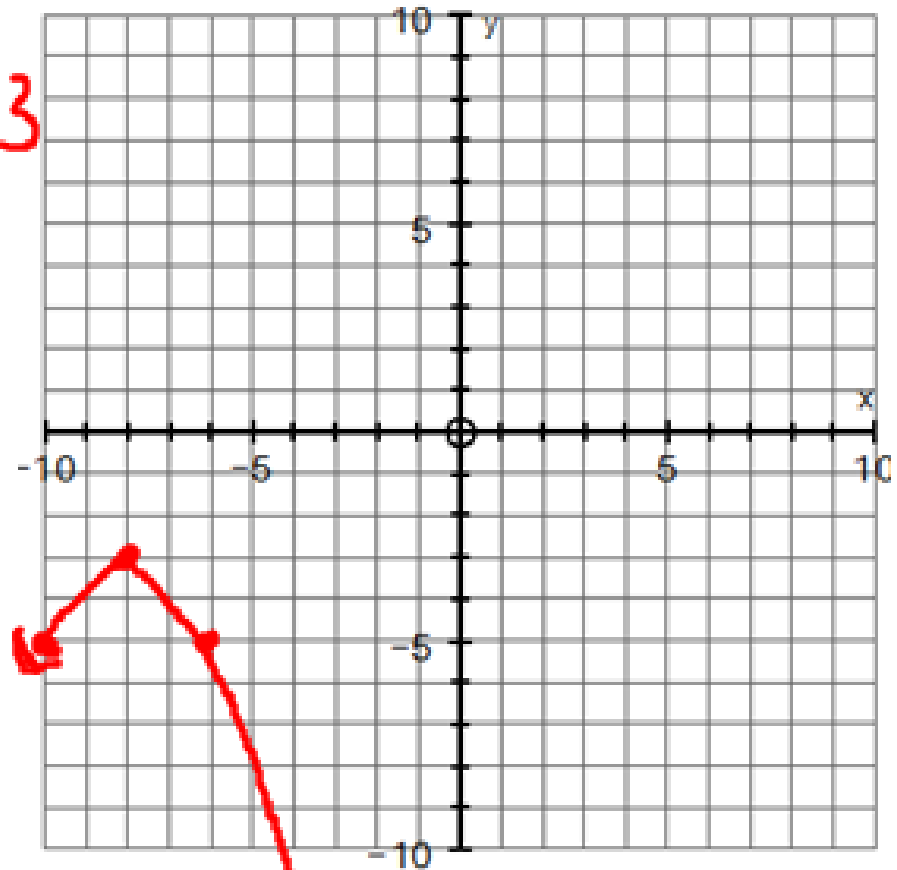
$$(x, y) \rightarrow (2x-8, -2y-3)$$

$$\begin{array}{r|l} -3 & 9 \\ -2 & 4 \\ -1 & 1 \\ 0 & 0 \\ 1 & 1 \\ 2 & 4 \\ 3 & 9 \end{array}$$

$$\begin{array}{r|l} -14 & -2 \\ -12 & -1 \\ -10 & -5 \\ -8 & -3 \\ -6 & -5 \\ -4 & -11 \end{array}$$

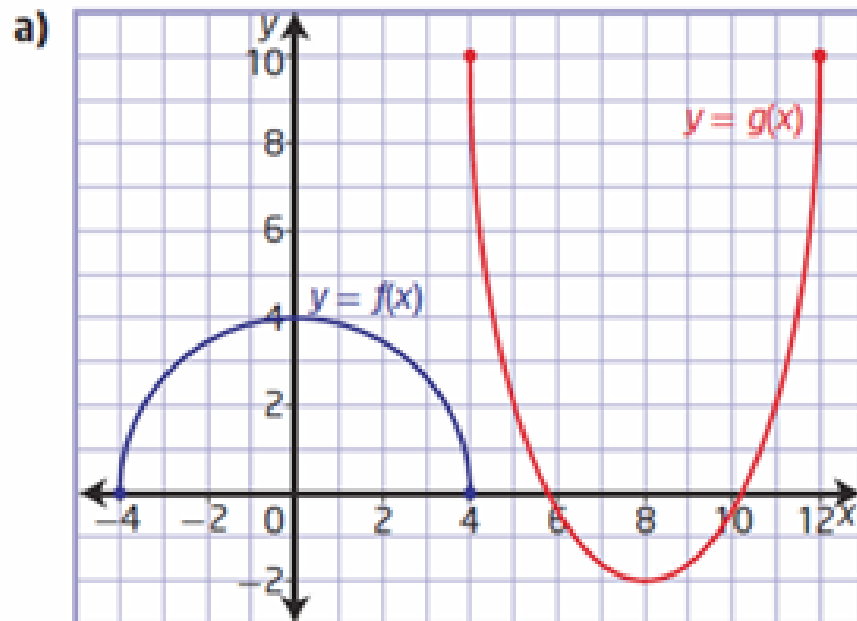
← I can't graph

from $y = x^2$



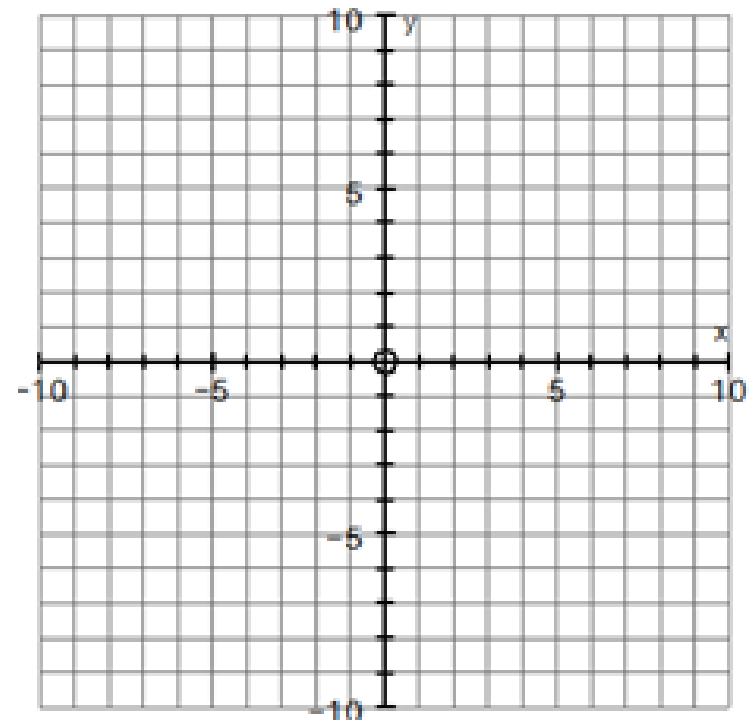
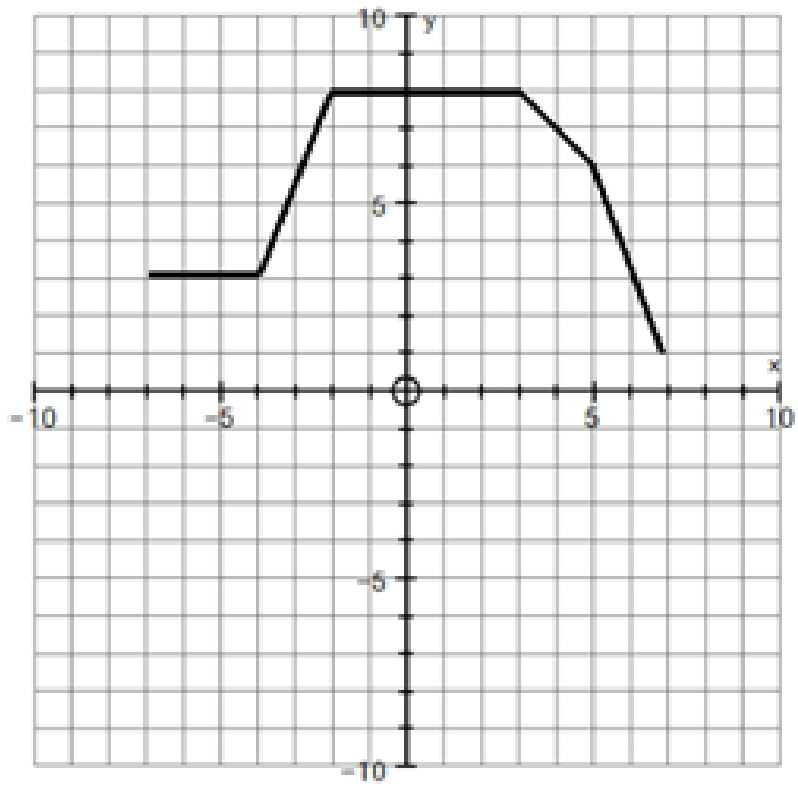
HW: pg 38 #1-11, 15

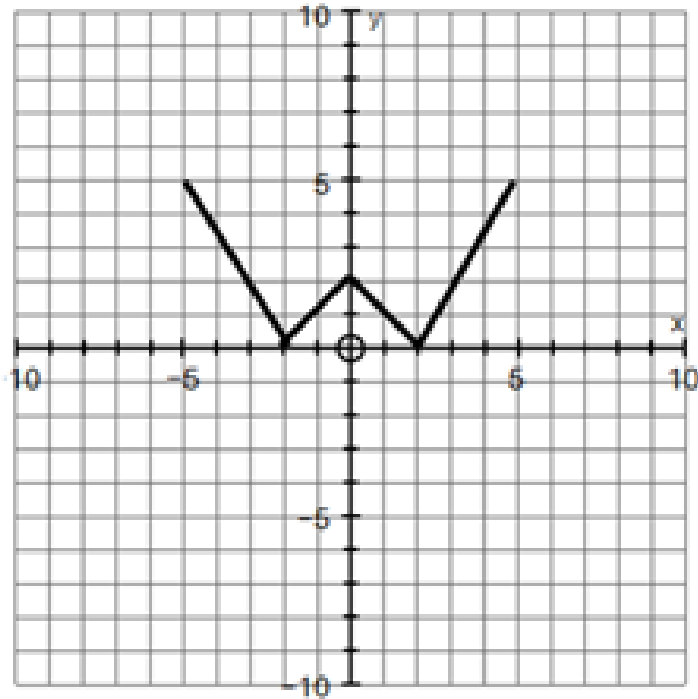
10. The graph of the function $y = g(x)$ represents a transformation of the graph of $y = f(x)$. Determine the equation of $g(x)$ in the form $y = af(b(x - h)) + k$.



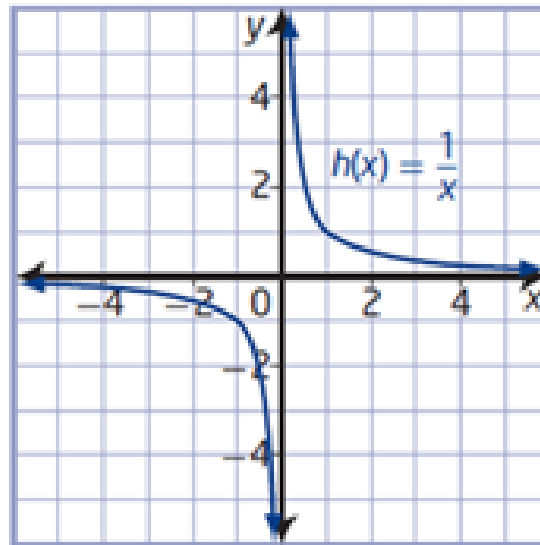
HW: pg 38 #1-11, 15

Blank Graphs





c)



c)

