

① a)  $f(g(x)) = (x^2 + 1)^2$

b)  $g(f(x)) = (x^2)^2 + 1$

c)  $(g \circ f \circ h)(x) = g(f(x)) \cdot h(x)$   
 want see this.  $= ((x^2)^2 + 1)\sqrt{x}$

d)  $g(x) + h(x) = x^2 + 1 + \sqrt{x}$

e)  $g(x) - h(x) = x^2 + 1 - \sqrt{x}$

SKT when in this form

②.  $g(x) = a f(b(x-h)) + k$

vertical translation  
k units up

① - vertical stretch by a factor of a about the x-axis

⑤ horizontal translation h units right

② - horizontal stretch by a factor of

- reflection in x-axis if  $|a| < 0$

③ if  $|a| < 0$

- reflection in y-axis

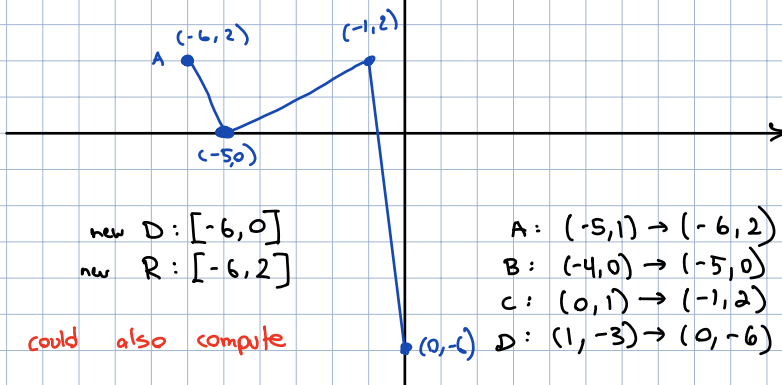
④ if  $|b| < 0$

③

a)

$g(x) = 2f(x+1)$

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



new D:  $[-6, 0]$

new R:  $[-6, 2]$

could also compute

A:  $(-5, 1) \rightarrow (-6, 2)$

B:  $(-4, 0) \rightarrow (-5, 0)$

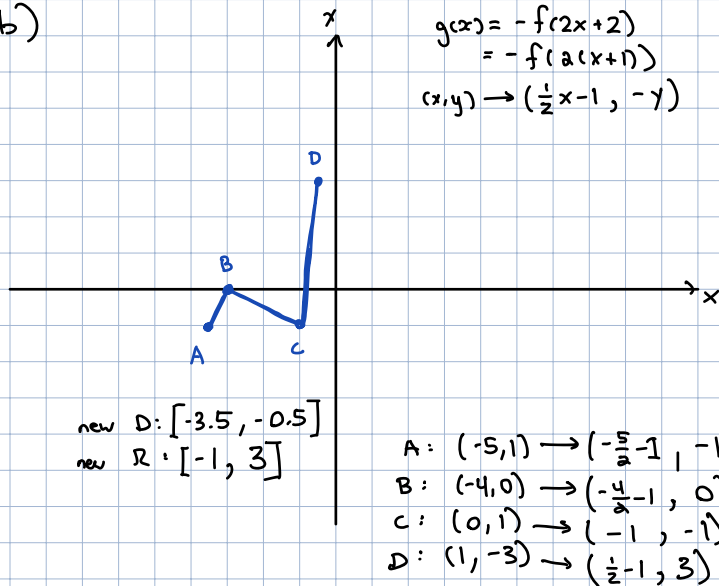
C:  $(0, 1) \rightarrow (-1, 2)$

D:  $(1, -3) \rightarrow (0, -6)$

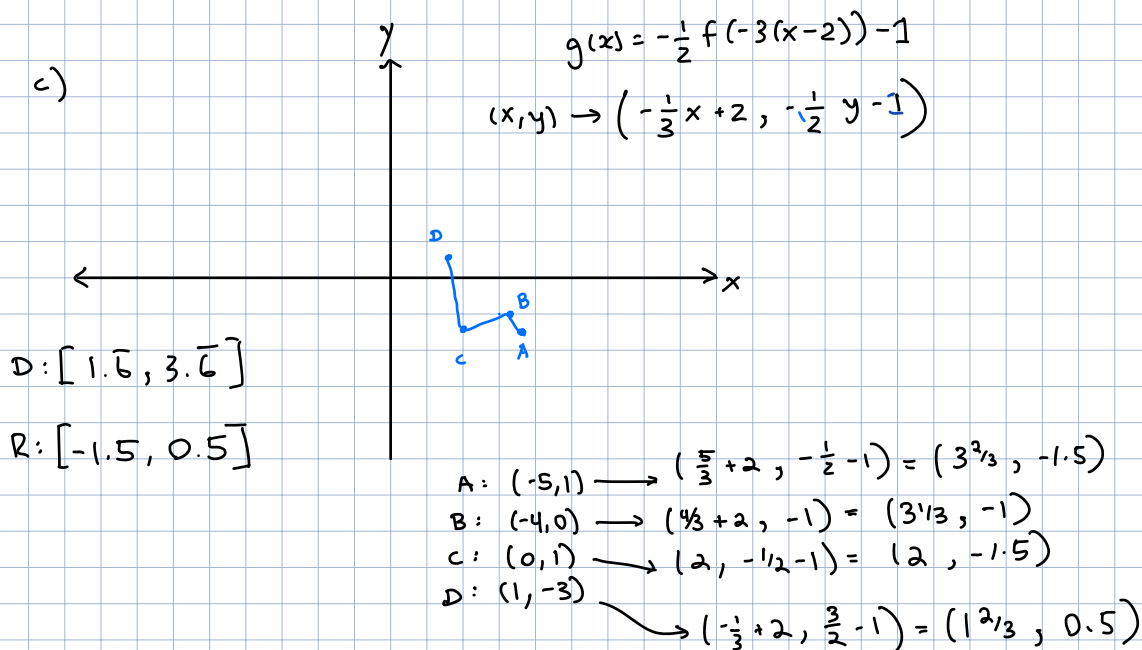
D:  $[-5, 1] \rightarrow [-5-1, 1-1]$   
 $[-6, 0]$

R:  $[-3, 1] \rightarrow [-6, 2]$

b)



c)



write out mapping step by step...

D)

Start.  
(x,y)

1)  $(x, -y)$

2)  $(2x, -y)$

3)  $(-y, 2x)$

4)  $(-y, 2x-3)$

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

A:  $(-5,1) \rightarrow (-1, -13)$

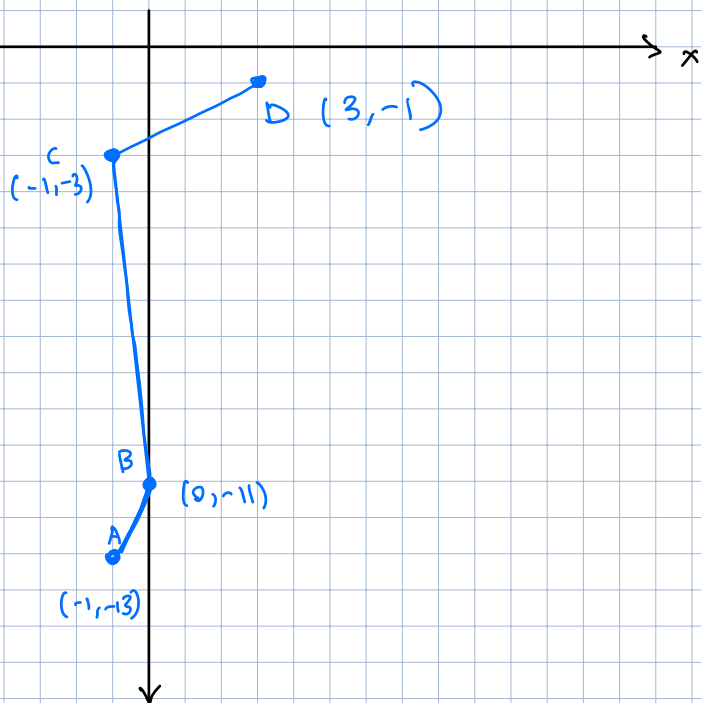
B:  $(-4,0) \rightarrow (0, -11)$

C:  $(0,1) \rightarrow (-1, -3)$

D:  $(1,-3) \rightarrow (3, -1)$

$$D: [-1, 3]$$

$$R: [-13, -1]$$



4.

$$f(x) = |x + 3| \quad x > 0$$

$$f(x) = x + 3 \quad \leftarrow \text{so}$$

$$y = x + 3$$

①  $y - 3 = x + 3, \quad y = x + 6$

②  $y = (x - 4) + 6, \quad y = x + 2$

③  $y = -x + 2$

④  $y + 2 = -x + 2, \quad y = -x$

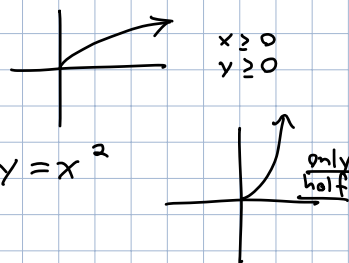
⑤  $y = -\frac{1}{a}x, \quad \text{now } 4 = -\frac{1}{a}(-20)$

$$\boxed{a = 5}$$

⑤

$$f(x) = \sqrt{x}$$

$$y = \sqrt{x}$$



①

$$x = \sqrt{y}$$

$$y = x^2$$

②

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

③

$$y - 3 = \left(\frac{1}{2}x\right)^2, \quad y = \left(\frac{1}{2}x\right)^2 + 3$$

④

$$\frac{1}{2}y = \left(\frac{1}{2}x\right)^2 + 3, \quad y = 2\left(\frac{1}{2}x\right)^2 + 6$$

$$g(x) = 2\left(\frac{1}{2}x\right)^2 + 6, \quad x \geq 0$$

⑥

$$f(x) = \frac{1}{x}$$

$$g(x) = \frac{2}{-3(x+1)} + 1$$

①

v.s. about x-axis by a factor of 2

②

H.S. about y-axis by a factor of 1/3

③

reflection in y-axis

④

Vertical translation 1 unit up

⑤

horizontal translation 1 unit left.

⑦

$$f(x) = \frac{1}{2}(3(x+1))^2$$

$$g(x) = 3x^2 + 2$$

$$\text{Start: } y = \frac{1}{2}(3(x+1))^2$$

(1)

Shift 1 unit right:  $x \rightarrow (x-1)$

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

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

(2)

v.s. by 2 about x-axis:  $y \rightarrow \frac{y}{2}$

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

$$y = (3x)^2$$

(3) h.s. by a factor of 3 about y-axis:

$$x \rightarrow \frac{x}{3} \quad y = \left(3\left(\frac{x}{3}\right)\right)^2 = x^2$$

(4) v.s by a factor of 3 about x-axis:

$$y \rightarrow \frac{y}{3} \quad \frac{y}{3} = x^2 \quad \boxed{y = 3x^2}$$

(5) v.t. 2 units up.:

$$y-2 = 3x^2, \quad \boxed{y = 3x^2 + 2}$$

\* NOTE: Answers may vary for this problem.  
this is one possible sol'n.

(8)

$$y = \sqrt{x} + 1$$

①  $y = \sqrt{3(x-1)+1} + 1$   $(x-1) \rightarrow 3(x-1)$

②  $x = \sqrt{3(y-1)+1} + 1$   $\begin{cases} x \rightarrow y \\ y \rightarrow x \end{cases}$

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

$(y+2) \rightarrow \frac{1}{a}(y+2)$   $x = \sqrt{3\left(\frac{1}{a}(y+2)-3\right)+1} + 1$

$$g(3) = 4$$

$$3 = \sqrt{3\left(\frac{6}{a}-3\right)+1} + 1$$

$$2 = \sqrt{\frac{18}{a}-8}$$

$$4 = \frac{18}{a} - 8$$

$$12 = \frac{18}{a}$$

$$\boxed{a = \frac{18}{12} = \frac{3}{2}}$$