1. Which of the following represents the equation of $y = f(x)$ after it has been shifted 2 units to the right and 1 unit down?

HT = 2
VT = −1

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

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

C) $y = f(x+2)+1$

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

2. The graph of $y = f(x)$ has been reflected across the y-axis and stretched vertically by a factor of $\frac{1}{2}$. Which of the equations would describe the new graph?

y = f(−x)
VS = 1/2

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

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

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

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

3. The graph of $y = f(x)$ has a domain of $-2 \le x \le 6$ and a range of $0 \le y \le 10$. Which of the following would best describe the domain and range for $y = -f(2x)+1$?

A) $D: -2 \le x \le 6$
$R: -9 \le y \le 1$

B) $D: -6 \le x \le 2$
$R: 1 \le y \le 11$

C) $D: -1 \le x \le 3$
$R: -9 \le y \le 1$

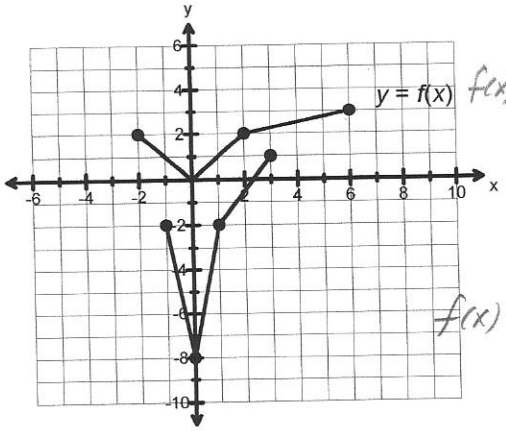
D) $D: -3 \le x \le 1$
$R: 1 \le y \le 11$

HS = 1/2 ← affects domain
VT = 1 ← affect range
reflection over x axis ← affects range

D: $-2 \le x \le 6 \Rightarrow -1 \le x \le 3$

R: $0 \le y \le 10 \Rightarrow -10 \le y \le 0 \Rightarrow -9 \le y \le 1$

4. Which equation best describes the transformations that have been applied to $y = f(x)$ as shown in the graph?



A) $y = 3f\left(\frac{1}{2}x\right) - 8$

B) $y = 3f(2x) - 8$

C) $y = \frac{1}{3}f(2x) + 8$

D) $y = \frac{1}{3}f\left(\frac{1}{2}x\right) + 8$

$f(x)$ $D: [-2, 6] = 8$
$D: [-1, 3] = 4$
$HS = \frac{4}{8} = \frac{1}{2}$

$f(x)$ $R: [0, 3] = 3$
$R: [-8, 1] = 9$
$VS = \frac{9}{3} = 3$

$f(6, 3) \rightarrow (3, 9)$
HS, VS

$(3, 9) \rightarrow (3, 1) \Rightarrow VT = -8$

5. The graph of a function has a point with coordinates $(a, -b)$. If the graph has been reflected about the x-axis, horizontally stretched about the y-axis by a factor of 2 and translated 5 units down, what would the coordinates of the image point be?

A) $(a, 2b - 5)$ B) $(2a, b - 5)$ C) $(-2a, b - 5)$ D) $(-a, 2b - 5)$

$(a, -b) \rightarrow (a, b) \rightarrow (2a, b) \rightarrow (2a, b - 5)$
Reflection on x-axis

6. Given the point (0,5) is on a graph. For which of the following transformations would it remain an invariant point?

A) reflection in the x-axis, vertical stretch
B) reflection in the y-axis, horizontal stretch ← affects x coordinate which is 0
C) horizontal translation
D) vertical translation

7. What is the mapping rule for $y=-f\left(\frac{2}{3}x+4\right)-3$? $y=-f\left(\frac{2}{3}(x+6)\right)-3$

A) $(x,y)\to\left(\frac{2}{3}x-4,-y+3\right)$

B) $(x,y)\to\left(\frac{3}{2}x-4,-y+3\right)$

C) $(x,y)\to\left(\frac{2}{3}x+6,-y-3\right)$

D) $(x,y)\to\left(\frac{3}{2}x-6,-y-3\right)$

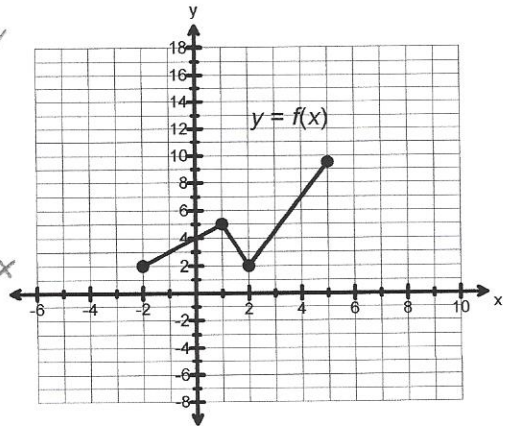
8. For the graph of $y=f(x)$ shown, which of the following statements is not true?

A) $(0,4)$ will be an invariant point for $y=f(-x)$ reflection on y $(0,4)\to(0,4)$

B) $(2,2)$ will be an invariant point for $y=f^{-1}(x)$ inverse $(2,2)\to(2,2)$

C) $(0,4)$ will be an invariant point for $y=-f(x)$ $(0,4)\to(0,-4)$ reflection on x

D) There are no invariant points for $y=-f(x)$



9. What is the equation for the image graph of $y=f(x)$ as shown?

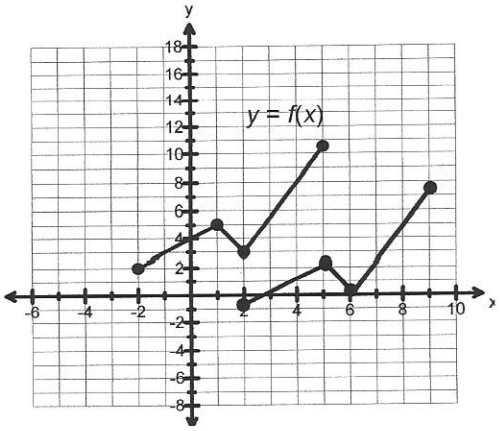
A) $y=f(x-4)+3$

B) $y=f(x+4)+3$

C) $y=f(x+4)-3$

D) $y=f(x-4)-3$

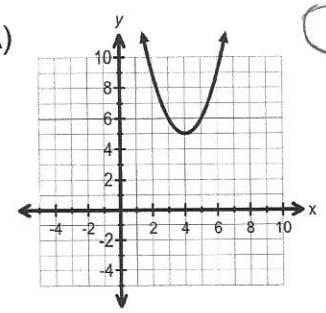
4 Right
3 down

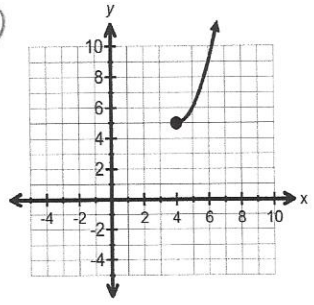


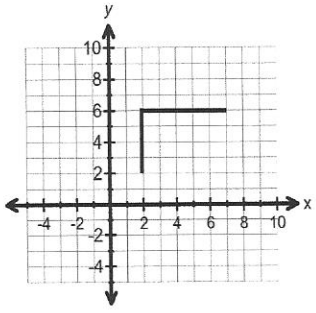
10. If a function has a point with coordinates $(a,-b)$, what are the coordinates of a point on the graph of $y=f^{-1}(x)$? switch

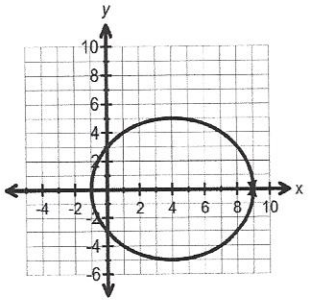
A) $(a,-b)$ B) $(b,-a)$ C) $(-b,a)$ D) $(-a,b)$

11. Which of the graphs shown is the graph of a function which will have an inverse that is a function?

A) 

B) 

C) 

D) 

→ pass the horizontal line test

12. Given $y=f(x)$ has been transformed by a reflection in the x-axis, a horizontal stretch of 4, a horizontal translation of 1 unit left and a vertical translation of 2 units up, what is the new equation for the image graph?

A) $y=-f(4x+1)+2$ B) $y=f\left(-4(x-1)\right)+2$

C) $y=-f(\frac{1}{4}(x+1))+2$ D) $y=f(-\frac{1}{4}x+1)+2$

$y=f(x)$

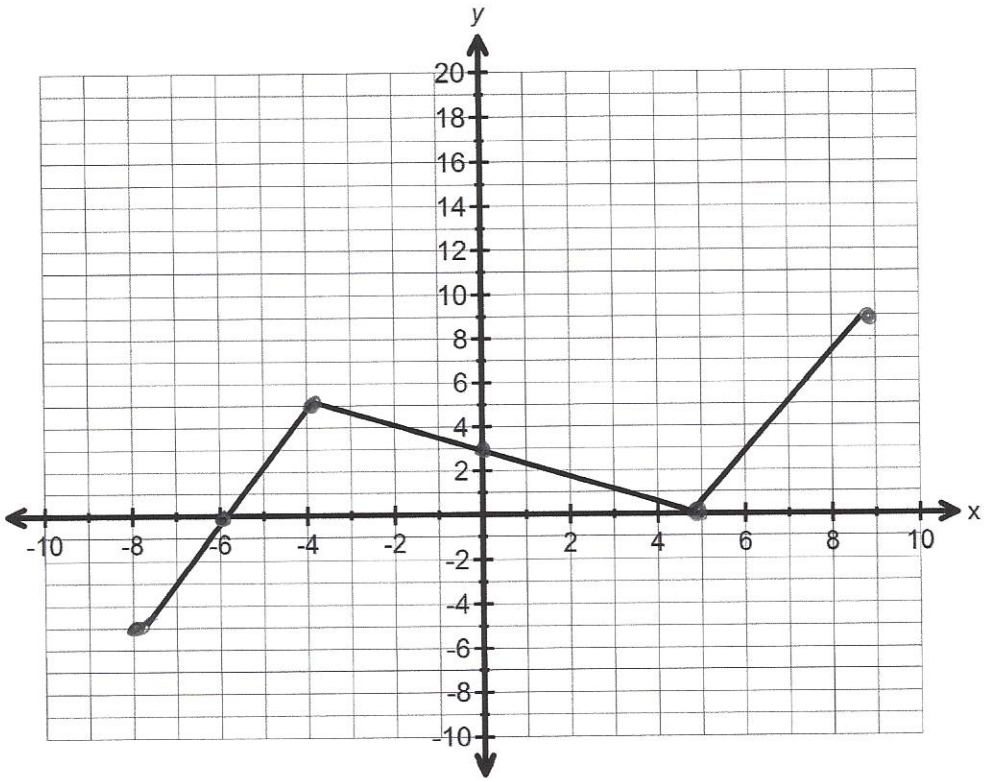
$y=-f(x)$

$y=-f(\frac{1}{4}x)$

$y=-f(\frac{1}{4}(x+1))+2$

13. Given the graph $y = f(x)$ shown, sketch the graph for each of the following and state any invariant points

i) $y = 2f\left(-3(x+1)\right) - 2$



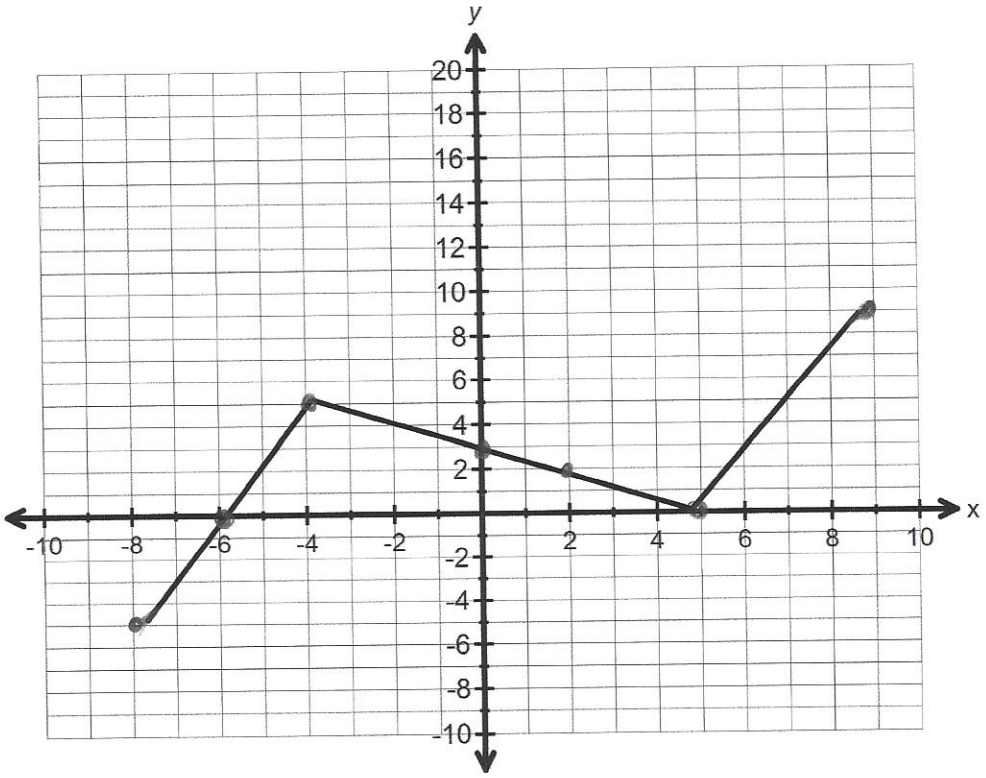
$(x, y) \rightarrow \left(-\frac{1}{3}x - 1,\ 2y - 2\right)$

x	y
-8	-5
-6	0
-4	5
0	3
5	0
9	9

$\rightarrow$

x	y
$5/3$	-12
1	-2
$\frac{1}{3}$	8
-1	4
$-8/3$	-2
-4	16

ii) $y = f^{-1}(x)$



$(x, y) \rightarrow (y, x)$

x	y
-8	-5
-6	0
-4	5
0	3
5	0
9	9

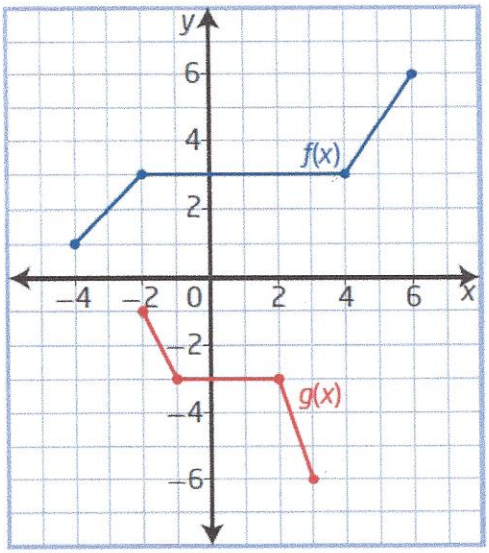
$\rightarrow$

$(-5, -8)$
$(0, -6)$
$(5, -4)$
$(3, 0)$
$(0, 5)$
$(9, 9)$

invariant points $(2, 2)$ and $(9, 9)$

14. Determine the equation for the image of $y = f(x)$.

A)



reflection over x-axis

$f(x)$: Domain $[-4, 6] \Rightarrow 10$

$g(x)$: Domain $[-2, 3) \Rightarrow 5$

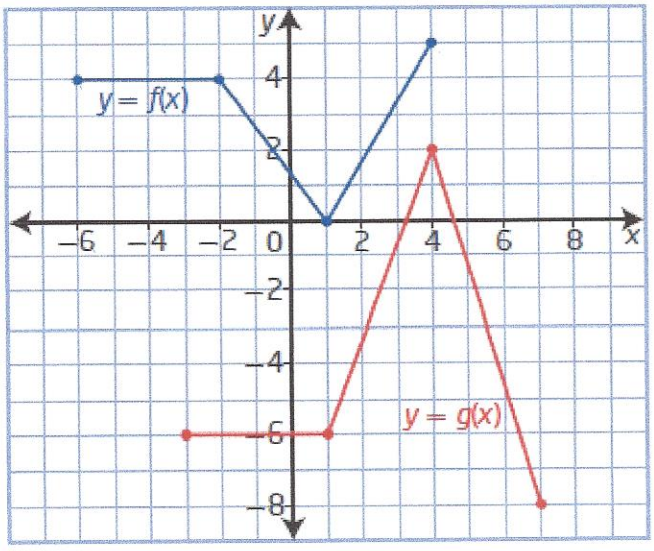
$HS = \frac{5}{10} = \frac{1}{2}$ $\quad b = 2$

$f(x)$: Range $[1, 6]$ Same $VS = 1$

$g(x)$ Range $[-1, -6]$

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

B)



$f(x)$: Domain $[-6, 4] = 10$

$g(x)$: Domain $[-3, 7] = 10$ $\quad HS = 1$

$f(x)$: Range $[0, 5) = 5$

$g(x)$ Range $[-8, 2] = 10$

$VS = \frac{10}{5} = 2$ $\quad a = 2$

reflection over x axis

$f(x)$ $(4, 5) \rightarrow (4, -10)$

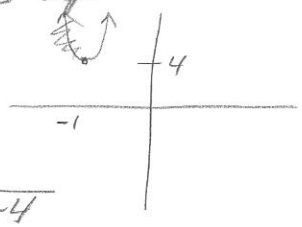
$(4, -10) \rightarrow 7, -8$ $\quad VT = +2$

$HT = \overset{+}{-}3$

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

15. Algebraically determine the inverse of $f(x)=(x+1)^2+4$. State the restricted domain for the relation so that the inverse is a function.

$\vee(-1, 4)$ opens up



$y=(x+1)^2+4$

$x=(y+1)^2+4$

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

$\pm\sqrt{x-4}=y+1$

$\boxed{y=-1\pm\sqrt{x-4}}$

Restriction

$x\geq -1 \quad f^{-1}(x)=-1+\sqrt{x-4}$

or

$x\leq -1 \quad f^{-1}(x)=-1-\sqrt{x-4}$

16. The graph of $y=f(x)$ is transformed to produce the graph of $y=-5f(2x-6)-1$. What is the horizontal translation? If the point (-4, 10) lies on the graph of $f(x)$ what is the image point on the graph of $y=-5f(2x-6)-1$.

$y=-5f(2(x-3))-1$ HT = 3 right

$(x,y)\rightarrow(\frac{1}{2}x+3,\ -5y-1)$

$(-4,10)\rightarrow(1,-51)$

17. Explain how the transformations described by $y=f(\frac{1}{2}x+1)$ and $y=f(\frac{1}{2}(x+1))$ are similar and how are they different.

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

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

$\downarrow$

HS = 2

HT = 2 left

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

HS = 2

HT = 1 left