Ch. 2 Practice Test # Solutions

1. **D.**
   Break **y = *f* (3x − 6)** down to **y = *f* (3(x − 2))**. From this we can see a *horizontal compression* by a factor of $\frac{1}{3}$ and a *horizontal translation* of 2 units RIGHT.

2. **C.**
   If (6, −5) is a point on y = *f* (x) then for y = −*f* (2(x + 2)) – 3 there is a

   - Reflection in the x-axis (y is replaced with –y) (6, −5) $\longrightarrow$ (6, 5)
   - Horizontal compression by a factor of $\frac{1}{2}$ (6, 5) $\longrightarrow$ (3, 5)
   - Horizontal translation 2 units LEFT (3, 5) $\longrightarrow$ (1, 5)
   - Vertical translation 3 units DOWN (1, 5) $\longrightarrow$ **(1, 2)**

3. **B.**
   y = *f* (2x + 10) $\longrightarrow$ **y = *f* (2(x + 5)**

   - Horizontal compression by a factor of $\frac{1}{2}$ (4, −3) $\longrightarrow$ (2, −3)
   - Horizontal translation 5 units LEFT (2, −3) $\longrightarrow$ **(−3, −3)**

4. **C.**
   Horizontal translation 5 units LEFT so (a, b) $\longrightarrow$ (a−5, b)
   Vertical translation 1 unit DOWN so (a−5, b) $\longrightarrow$ **(a−5, b−1)**

5. **D.**
   Horizontal translation 2 units LEFT
   Vertical translation 5 units DOWN

6. **B.**

   $y = \frac{1}{3}x - 7 \longrightarrow x = \frac{1}{3}y - 7 \longrightarrow x + 7 = \frac{1}{3}y \longrightarrow 3(x + 7) = y$

   $3x + 21 = y \longrightarrow$ $\boldsymbol{f^{-1}(x) = 3x + 21}$

7. A.

$y = f(x) \xrightarrow[\text{horiz. comp.}]{} y = f(3x) \xrightarrow[\text{horiz. translation}]{} y = f(3(x+2)) \longrightarrow$ $\mathbf{y = f(3x + 6))}$

8. B.

$y = \sqrt{x} \xrightarrow[\text{horiz. Comp}]{} y = \sqrt{\frac{1}{4}x} \xrightarrow[\text{horiz. translation}]{} y = \sqrt{\frac{1}{4}(x-3)}$

9. C.

$y = -f(2x) + 3$ shows a reflection in the x-axis $(4, -5) \longrightarrow (4, 5)$

a horiz. comp. by a factor of $\frac{1}{2}$ $(4, 5) \longrightarrow (2, 5)$

and a vert. trans. 3 units UP $(2, 5) \longrightarrow$ **(2, 8)**

10. B.

Two things have happened with this graph

- It has been reflected in the y-axis (replace x with –x)
- It has *then* been translated 8 units RIGHT (replace x with x−8)

11. C.

$4y = f(-x)$ represents a vertical compression of a factor of $\frac{1}{4}$

which means (6, −12) becomes (6, −3) and since x has been replaced with (−x)

(6, −3) becomes **(−6, −3)**

12. B.

Two things have happened with this graph

- It has been horizontally expanded by a factor of 2 (replace x with $\frac{1}{2}$x)
- It has *then* been translated 1 unit RIGHT (replace x with x−1)

13. D.

Following the order given:

(9, −12) becomes (27, −12)

(27, −12) becomes (27, 12)

(27, 12) becomes (27, 7)

(27, 7) becomes (7, 27)

14. C or D.

The inverse of $y = x^2$ is $x = y^2$

Isolate this for y and get $y = \sqrt{x}$ but, $\sqrt{x} = x^{1/2}$

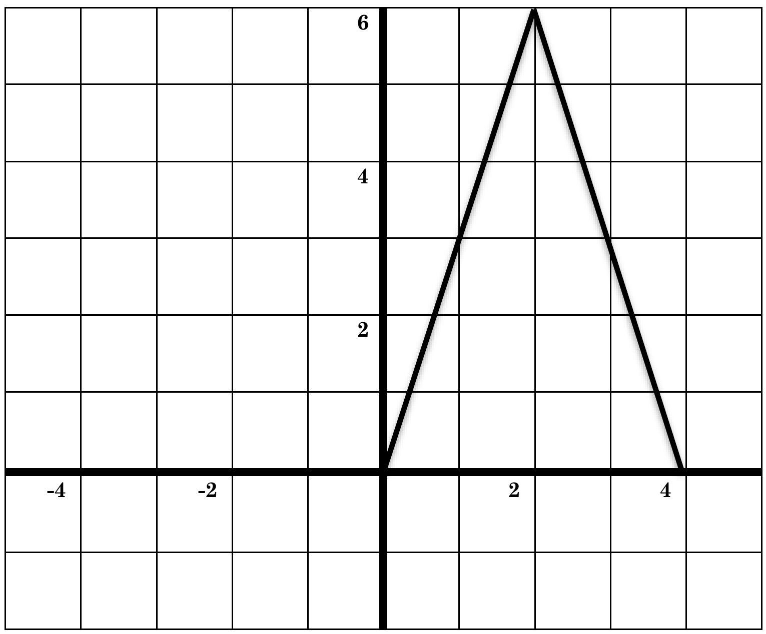
So,….$y = x^{1/2}$

15. C.

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

$\frac{x-3}{2} = y \longrightarrow \boldsymbol{f^{-1}(x) = \frac{x-3}{2}}$

16.

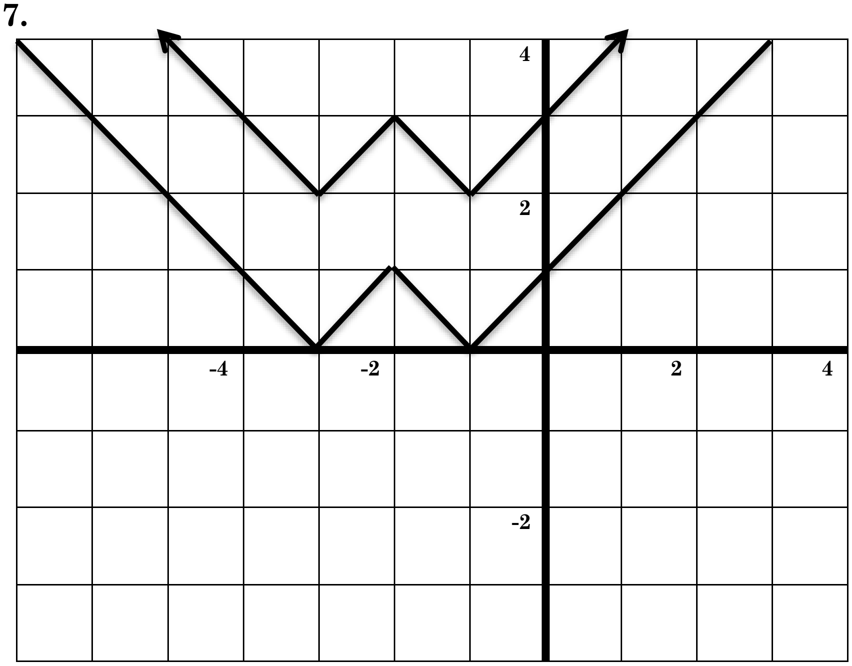


The vertical expansion by a factor of 3 transforms the point (0, 2) to (0, 6).

Next, the horizontal translation 2 units right transforms (0, 6) to (2, 6)

The points (-2, 0) and (2, 0), at the base, move to (0, 0) and (4, 0) respectively

17.



First: Reflect the portion of the graph below the x-axis, above the x-axis.

Second: Translate the graph 2 units UP

18. The y-coordinate is only affected. The vertical expansion by a factor of 2 transforms the point to (6, 20). The reciprocal of the function simply requires us to take the reciprocal of the y-coordinate which gives us $\mathbf{(6, \frac{1}{20})}$

19.

Two things have happened with this graph

- It has been horizontally compressed by a factor of $\frac{1}{2}$ (replace x with 2x)

$$y = f(2x)$$

- It has *then* been translated 3 units RIGHT (replace x with x–3)

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

The final equation would be $\mathbf{y = \boldsymbol{f}(2x-6)}$

20.

The solution is obtained by work "backwards".

If (2, −8) is on the graph of $y = f(x-3) + 4$, then the x-coordinate and y-coordinate on $y = f(x)$ are (2−3, −8−4) $\longrightarrow$ **(−1, −12)**

y = *f* (x) underwent a horizontal translation of 3 units left so we must move 3 units right to determine the original x-coordinate
y = *f* (x) underwent a vertical translation of 4 units up so we must move 4 units down to determine the original y-coordinate

21.

A maximum <u>value</u> on y = *f*(x) represents the y-coordinate. For $y = \frac{1}{3} f(\frac{1}{2}x)$ the y-coordinate undergoes a vertical compression by a factor of $\frac{1}{3}$.

Therefore the maximum value of $y = \frac{1}{3} f(\frac{1}{2}x)$ is **3.**

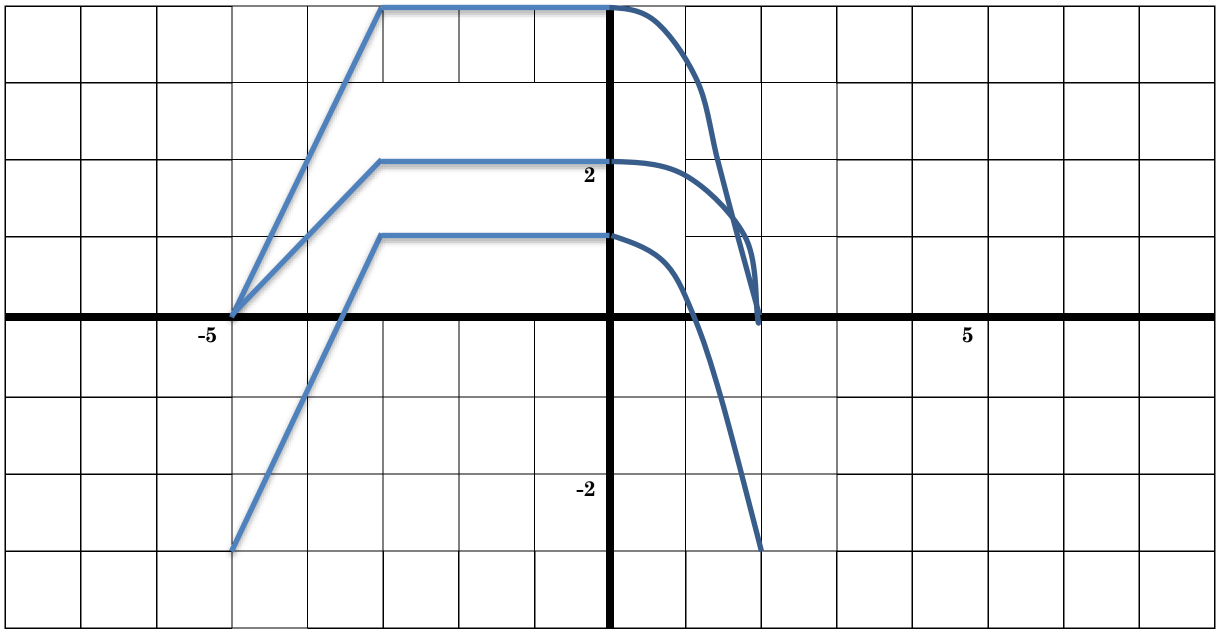
22.

$$f(x) = \frac{3x}{x+1} \longrightarrow y = \frac{3x}{x+1} \longrightarrow x = \frac{3y}{y+1} \longrightarrow x(y+1) = 3y$$

$$xy + x = 3y \longrightarrow x = 3y - xy \longrightarrow x = y(3 - x) \longrightarrow \frac{x}{3-x} = y$$

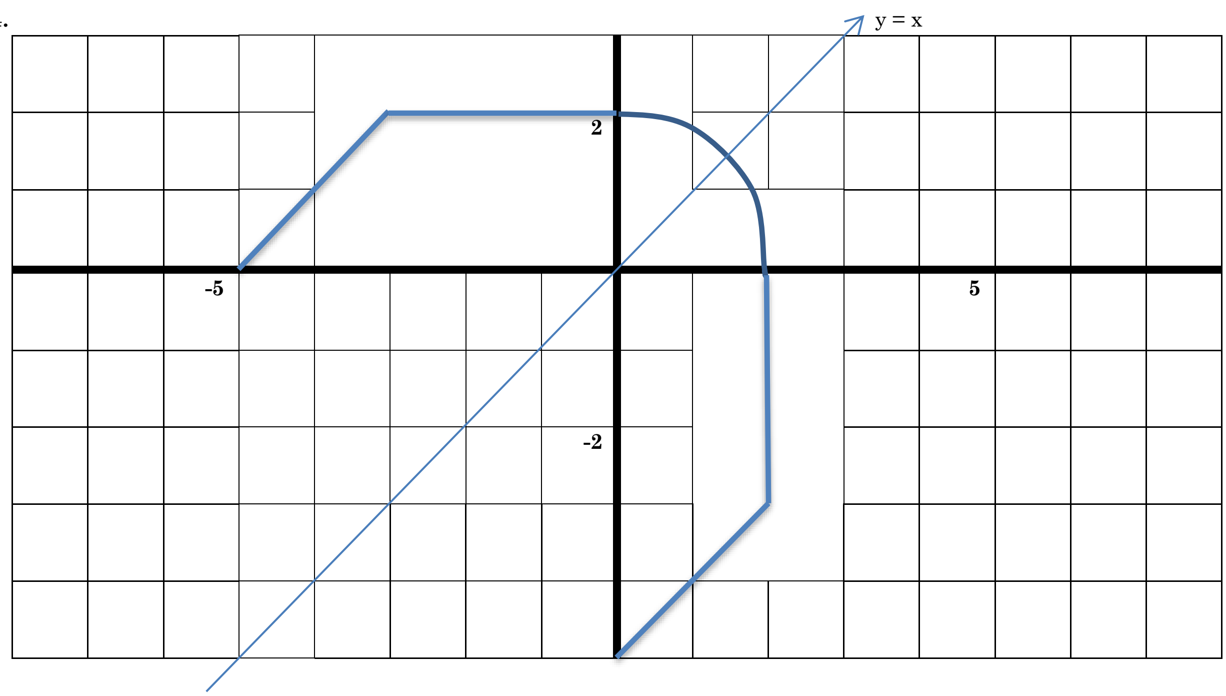
$$\boldsymbol{f^{-1}(x) = \frac{x}{3-x}}$$

23.



First: Vertically expand the shape by a factor of 2
Second: Vertically translate the shape 3 units DOWN.

24.



Reflect the graph in the line y = x. This can be done by switching the x and y coordinates of key points and then plot them.

(-5, 0) reflects to (0, -5)

(-3, 2) reflects to (2, -3)

(0, 2) reflects to (2, 0)

(2, 0) reflects to (0, 2)……and then we connect the dots.