Mth 098 – Intermediate Algebra – **Practice Exam 3 Solutions**

1.

a. $2^2 \stackrel{?}{=} 1^2 + 2 \cdot 1 - 1 \quad \Rightarrow \quad 4 \stackrel{?}{=} 1 + 2 - 1 \quad \Rightarrow \quad 4 \stackrel{?}{=} 2$

No, the ordered pair is not a solution to the equation.

b. $-2^2 + 2 \cdot 1^2 \stackrel{?}{=} -2 \quad \Rightarrow \quad -4 + 2 \cdot 1 \stackrel{?}{=} -2 \quad -2 \stackrel{?}{=} -2$

Yes, the ordered pair is a solution to the equation.

2. State whether each graph is the graph of a function.
   a. Yes, no vertical lines cross the graph more than once.
   b. No, a vertical line crosses the graph twice.
   c. Yes, no vertical lines cross the graph more than once.

3.

a. $h(0) = -16 \cdot 0^2 + 20 \cdot 0 = 0$

b. $h(1) = -16 \cdot 1^2 + 20 \cdot 1 = -16 + 20 = 4$

4. The domain is $[-3, 3]$, and the range is $[-2, 3]$.

5.

a. Solving for *y*, $y = -\frac{2}{3}x + 2$, so the slope of the line is $-\frac{2}{3}$.

b. This is a horizontal line, so the slope is 0.

c. This is in slope-intercept form, so the slope is the coefficient of *x*. In this case, $m = -1$.

6. $m = \dfrac{2-0}{-2-(-2)} = \dfrac{2-0}{-2+2} = \dfrac{2}{0} \quad \Rightarrow \quad$ undefined

7.

a. $m > 0$
   $b < 0$

b. $m < 0$
   $b > 0$

c. $m < 0$
   $b < 0$

8. $y = -\frac{2}{3}x + 3$

9. $m = \dfrac{5-3}{2-2} = \dfrac{2}{0} \quad \Rightarrow \quad$ undefined

So this is a vertical line. The equation is then $x = 2$.

10. We need to know the slope, so solve each equation for *y*.

$2x - y = 4 \quad \Rightarrow \quad y = 2x - 4$

$2x + 4y = 8 \quad \Rightarrow \quad y = -\frac{1}{2}x + 2$

We can see that the slopes are negative reciprocals, so these lines are perpendicular.

11. Since x = height and y = ideal weight, we can get two "points" $(62, 125)$ and $(66, 137)$. Using the slope formula, we see that

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{137 - 125}{66 - 62} = \dfrac{12}{4} = 3$.

To find an equation, we use the point-slope form.

$y - y_1 = m(x - x_1)$

$y - 125 = 3(x - 62)$

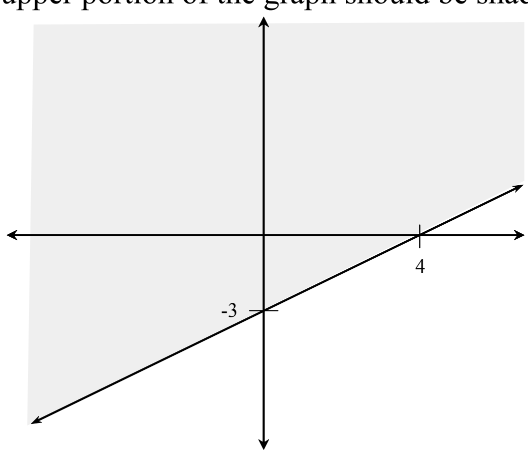
$y = 125 = 3x - 186$

$y = 3x - 61$

12.

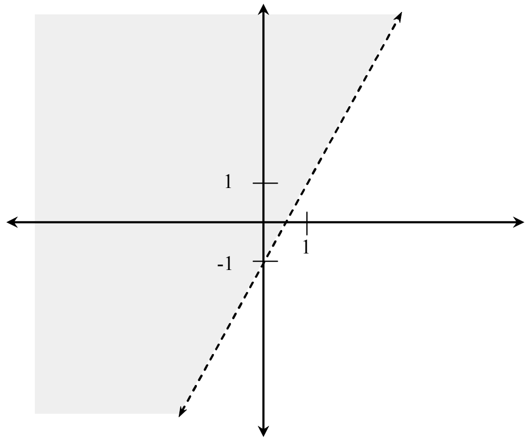
a. First, we graph $3x - 4y = 12$. Using the intercept method, we can find the points $(0, -3)$ and $(4, 0)$.

If we test the point $(0, 0)$ in the original equality, we get a true statement, so the upper portion of the graph should be shaded.



b. First, we graph the equation $y = 2x - 1$. Since this is in slope-intercept form, we use that technique.

If we test the point $(0, 0)$ in the original equality, we get a true statement, so the upper portion of the graph should be shaded.



13.

a. If we multiply the 2nd equation by 3, we get:

$$\begin{cases} 3a - 6b = \ \ 9 \\ -3a + 6b = -9 \end{cases}$$

Adding the equations gives $0 = 0$.

Since this is a true statement, these must be the same line. The solution set is then: $\{(a, b) \mid 3a - 6b = 9\}$.

b. There are two ways to solve this problem. I will solve the 1st equation for *m* and substitute into the 2nd equation, though one could easily do the opposite.

$m + 2n = 4 \quad \Rightarrow \quad m = 4 - 2n$

Substituting,

$2(4 - 2n) + n = 8 \quad \Rightarrow \quad 8 - 4n + n = 8 \quad \Rightarrow \quad 8 - 3n = 8 \quad \Rightarrow \quad `-3n = 0 \quad \Rightarrow \quad n = 0$

If we substitute into either equation, we can see that $m = 4$.

To check, $4 + 2 \cdot 0 = 4 + 0 = 4$ and $2 \cdot 4 + 0 = 8 + 0 = 8$.

14. First, we need two variables. I'll let x = hours walked and y = hours jogged. We then need two equations. The basic equation here is using total hours: $x + y = 6$. The second equation involves the distance. Remember that distance = (rate)(time), so the second equation is roughly (distance walking) + (distance jogging) = (total distance). In algebra: $3x + 5y = 26$. The system is then:

$$\begin{cases} x + \ \ y = 6 \\ 3x + 5y = 26 \end{cases}$$

To solve this, I would use the elimination (addition) method. Multiply the first equation by -3 and then add.

$$\begin{cases} x + \ \ y = 6 \\ 3x + 5y = 26 \end{cases} \Rightarrow \begin{cases} -3x - 3y = -18 \\ \ \ 3x + 5y = 26 \end{cases} \Rightarrow \ 2y = 8 \quad y = 4$$

Since we're looking for *x*, we can substitute *y* into the first equation to get $x = 2$.

Therefore, the marathoner can walk for 2 hours.

15. First, graph $4x + 3y = 24$ by finding the intercepts. They are $(0, 8)$ and $(6, 0)$. The intercepts for $2x + 3y = 18$ are $(0, 6)$ and $(9, 0)$.

To see where the two lines cross, we can solve the system:

$$\begin{cases} 4x + 3y = 24 \\ 2x + 3y = 18 \end{cases}$$

To do that, I would multiply the 2nd by -1.

$$\begin{cases} 4x + 3y = 24 \\ -1(2x + 3y = 18) \end{cases} \Rightarrow \begin{cases} \ \ 4x + 3y = \ \ 24 \\ -2x - 3y = -18 \end{cases} \Rightarrow \ 2x = 6 \ \Rightarrow \ x = 3$$

Substituting in to either equation and solving for *y*, we see that $y = 4$, so the two lines intersect at the point $(3, 4)$.

The graph below shows the solution – I have labeled sparsely because it's a bit of a pain to do on the computer.