Math 121 – Section 2.2 Solutions

9. (a) $f(0) = 3$, $f(-6) = -3$
   (b) $f(6) = 0$, $f(11) = 1$
   (c) $f(3)$ is positive
   (d) $f(-4)$ is negative
   (e) $f(x) = 0$ when $x = -3, 6, 10$
   (f) $f(x) > 0$ when $-3 < x < 6$ or $10 < x < 11$
   (g) The domain of $f(x)$ is $-6 \leq x \leq 11$.
   (h) The range of $f(x)$ is $-3 \leq y \leq 4$.
   (i) The x-intercepts are $(-3, 0), (6, 0), (10, 0)$.
   (j) The y-intercept is $(0, 3)$.
   (k) The line $y = \dfrac{1}{2}$ intersects the graph 3 times.
   (l) The line $x = 5$ intersects the graph 1 time.
   (m) $f(x) = 3$ when $x = 0, 4$
   (n) $f(x) = -2$ when $x = -5, 8$

11. The given graph is not a function. It does not pass the vertical line test (there are vertical lines that intersect the graph more than once).

13. The given graph is a function.
   (a) The domain is $[-\pi, \pi]$. The range is $[-1, 1]$.
   (b) The x-intercepts are $\left(-\dfrac{\pi}{2}, 0\right), \left(\dfrac{\pi}{2}, 0\right)$. The y-intercept is $(0, 1)$.
   (c) The graph has symmetry with respect to the y-axis.

16. The given graph is not a function.

24. $f(x) = -3x^2 + 5x$
   (a) The point $(-1, 2)$ is not on the graph since $f(-1) = -3(-1)^2 + 5(-1) = -8 \neq 2$.
   (b) $f(-2) = -3(-2)^2 + 5(-2) = -22$. Therefore, the point $(-2, -22)$ is on the graph.
   (c) If $f(x) = -2$ then,

$$\begin{aligned} -2 &= -3x^2 + 5x \\ 3x^2 - 5x - 2 &= 0 \\ (3x + 1)(x - 2) &= 0 \\ x = -\frac{1}{3},\ x &= 2 \end{aligned}$$

   Therefore, the points $\left(-\dfrac{1}{3}, -2\right)$ and $(2, -2)$ are on the graph.
   (d) The domain of $f(x)$ is all real numbers.

(e) Note that:

$$\begin{aligned} -3x^2 + 5x &= 0 \\ x(-3x + 5) &= 0 \\ x = 0,\ x &= \frac{5}{3} \end{aligned}$$

Therefore, the x-intercepts are $(0, 0)$ and $\left(\frac{5}{3}, 0\right)$.

(f) Since $f(0) = -3(0)^2 + 5(0) = 0$, the y-intercept is $(0, 0)$.