Section 2.1 Solutions

1) 

- x-intercepts: (-3,0), (3,0)
- y-intercept: (0,9)

2) 

- x-intercepts: (-2,0), (0,0)
- y-intercepts: (0,4)
3) \[ x\text{-intercepts}\]
\[ (-2, 0), (1, 0), (3, 0) \]
\[ y\text{-intercepts}\]
\[ (0, 6) \]

4) \[ x\text{-intercepts}\]
\[ (-3, 0), (-1, 0), (2, 0) \]
\[ y\text{-intercepts}\]
\[ (0, -6) \]
5) \(3x - 6y = 24\)

\[x\text{-intercept(s): let } y = 0\]
\[3x - 6(0) = 24\]
\[3x = 24\]
\[x = 8\]

\[y\text{-intercept(s): let } x = 0\]
\[3(0) - 6y = 24\]
\[-6y = 24\]
\[y = -4\]

\text{Answer: } x\text{-intercept } (8,0)\]
\[y\text{-intercept } (0,-4)\]

7) \(y^2 = x + 9\)

\[x\text{-intercept(s): let } y = 0\]
\[0^2 = x + 9\]
\[0 = x + 9\]
\[-9\]
\[-9 = x\]

\[y\text{-intercept(s): let } x = 0\]
\[y^2 = 0 + 9\]
\[y^2 = 9\]
\[\sqrt{y^2} = \sqrt{9}\]
\[y = \pm 3\]

\text{Answer: } x\text{-intercepts } (-9,0)\]
\[y\text{-intercepts } (0,3), (0,-3)\]
9) \[ y = 3x^2 + 4x - 7 \]

\[ \text{x-intercept(s): let } y = 0 \]
\[ 0 = 3x^2 + 4x - 7 \]
\[ 0 = (3x+7)(x-1) \]

\[ \begin{align*}
3x+7 &= 0 \\
-7 &= -7 \\
-7 -7 &= -7
\end{align*} \]

\[ \begin{align*}
x-1 &= 0 \\
+1 &= +1
\end{align*} \]

\[ \begin{align*}
3x &= -7 \\
\frac{3}{3} &= \frac{-7}{3}
\end{align*} \]

\[ x = \frac{-7}{3} \]

\[ \text{Answer: x-intercepts } (1,0), \left(-\frac{7}{3},0\right) \]
\[ \text{y-intercept } (0,-7) \]

11) \[ x ^ 2 = 3y^2 - 7y + 2 \]

\[ \text{x-intercept(s): let } y = 0 \]
\[ x = 3(0)^2 - 7(0) + 2 \]
\[ x = 0 - 0 + 2 \]
\[ x = 2 \]

\[ \text{Answer: x-intercept } (2,0) \]
\[ \text{y-intercepts } (0,2), (0,\frac{1}{3}) \]
13) \( \frac{x+1}{3x-6} \)

**x-intercept(s):** let \( y=0 \)

\[
0 = \frac{x+1}{3x-6}
\]

**Note:** Sufficient to solve for numerator, may ignore denominator

\[
0 = x + 1 \\
-1 = x
\]

\[
\text{Answer: x-intercept } (-1, 0) \]

\[
y\text{-intercept(s): } \text{let } x=0
\]

\[
y = \frac{0+1}{3(0)-6}
\]

\[
y = \frac{1}{-6}
\]

\[
y = \frac{-1}{6}
\]

\[
\text{Answer: y-intercept } (0, \frac{-1}{6})
\]

15) \( y = \frac{x^2 - 5x + 6}{x + 1} \)

**x-intercept(s):** let \( y=0 \)

\[
0 = \frac{x^2 - 5x + 6}{x + 1}
\]

**Note:** Sufficient to solve for numerator, may ignore denominator

\[
0 = x^2 - 5x + 6 \\
0 = (x-2)(x-3)
\]

\[
x-2 = 0 \quad x-3 = 0 \\
+2 \quad +3
\]

\[
x = 2 \quad x = 3
\]

\[
\text{Answer: x-intercepts } (2,0)(3,0) \]

\[
y\text{-intercept(s): } \text{let } x=0
\]

\[
y = \frac{(0)^2 - 5(0) + 6}{0 + 1}
\]

\[
y = \frac{6}{1}
\]

\[
y = 6
\]

\[
\text{Answer: y-intercept } (0, 6)\]
17) \( x^2 + y^2 = 16 \)

**x-intercepts:** Let \( y = 0 \)

\[ x^2 + (0)^2 = 16 \]

\[ x^2 = 16 \]

\[ x = \pm 4 \]

\( \sqrt{x^2} = \pm \sqrt{16} \)

**y-intercepts:** Let \( x = 0 \)

\[ (0)^2 + y^2 = 16 \]

\[ y^2 = 16 \]

\[ y = \pm 4 \]

\( \sqrt{y^2} = \pm \sqrt{16} \)

**Answer:** x-intercepts (4,0), (-4,0)

y-intercepts (0,4), (0,-4)

19) \( (1,2) \) \( b \)

\( (-1,2) \) \( c \)

\( (1,-2) \)

21) \( (-1,3) \) \( (b) \)

\( (1,3) \)

\( (-1,-3) \) \( (a) \)

\( (1,-3) \) \( (c) \)

23) \( (4,5) \) \( (a) \)

\( (4,-5) \) \( (b) \)

\( (4,5) \) \( (c) \)

25) \( (-3,2) \) \( (b) \)

\( (3,2) \) \( (c) \)

\( (-3,-2) \) \( (a) \)

\( (3,-2) \) \( (a) \)
31) symmetric to y-axis
33) symmetric to x-axis
35) symmetric to origin
37) none

39) \( y^2 = x - 4 \)
   
   solve for \( y \)
   
   \[ y^2 = \sqrt{x - 4} \]
   
   \[ y = \pm\sqrt{x - 4} \]

   graph on calculator
   
   \[ y = \sqrt{x - 4} \quad y_2 = -\sqrt{x - 4} \]

   suspect symmetry to x-axis
   confirm with algebra:
   replace \( y \) with \(-y\) in original equation:
   
   \[ (-y)^2 = x - 4 \]
   
   \[ (-y)(-y) = x - 4 \]

   \[ y^2 = x - 4 \]
   
   same as original, so has x-axis symmetry.

   answer: symmetric to x-axis
41) \( x^2 + y = 8 \)

Solve for \( y \)

\[
\begin{align*}
-x^2 + y &= 8 \\
y &= 8 - x^2
\end{align*}
\]

Graph on calculator

\[
\begin{array}{c}
\text{Graph of } y = 8 - x^2
\end{array}
\]

Suspect \( y \)-axis symmetry, confirm with Algebra.

Replace \(-x\) with \(x\) in the original equation:

\[
\begin{align*}
(-x)^2 + y &= 8 \\
(-x)(-x) + y &= 8 \\
x^2 + y &= 8
\end{align*}
\]

Equals original!

Answer: symmetric to \( y \)-axis

43) \( y = 2x^3 \)

Graph on calculator

\[
\begin{array}{c}
\text{Graph of } y = 2x^3
\end{array}
\]

Suspect origin symmetry, confirm with Algebra.

Replace \( x \) with \(-x\) and \( y \) with \(-y\):

\[
\begin{align*}
-y &= 2(-x)^3 \\
-y &= 2(-x)(-x)(-x) \\
-y &= 2 \cdot -1 \cdot x^3 \\
-1 \cdot y &= (-1) \cdot 2x^3 \\
y &= 2x^3
\end{align*}
\]

Equals original!

Answer: symmetric to origin
45) \( y = x^2 + 6x + 5 \)

Graph on calculator:

No apparent symmetry to x-axis, y-axis, or origin.

No Algebra necessary.

Answer: No symmetry

47) \( x^2 + 2 = y \)

Graph on calculator

Suspect y-axis symmetry, confirm with Algebra.

Replace \( x \) with \(-x\):

\((-x)^2 + 2 = y\)
\((-x)(-x) + 2 = y\)
\(x^2 + 2 = y\)

Equals original!

Answer: symmetric to y-axis
49) \( y^2 + x = 5 \)

Solve for \( y \):

\[
\frac{y^2 + x = 5}{-x -x}
\]

\[
y^2 = 5 - x
\]

\[
\sqrt{y^2} = \pm \sqrt{5 - x}
\]

\[
y = \pm \sqrt{5 - x}
\]

Graph on calculator:

\[
y_1 = \sqrt{5 - x}, \quad y_2 = -\sqrt{5 - x}
\]

Answer: symmetric to x-axis

Replace \( y \) with \(-y\) in original equation:

\[
(-y)^2 + x = 5
\]

\[
(-y)(-y) + x = 5
\]

\[
y^2 + x = 5
\]

Equals original!

Suspect x-axis symmetry, do Algebra to confirm.