Chapter 9.1 Check Your Understanding

Exercises 1–7 True or False. Give reasons.

1. The equation $3x - \sqrt{2}y = 5$ is linear in x and y.

Answer:

True; $3x - \sqrt{2}y = 5$ is of the form $ax + by = c$ where $a = 3$, $b = -\sqrt{2}$, $c = 5$.

2. The equation $3\sqrt{x^2} + 4y = 7$ is linear in x and y.

Answer:

False; since $\sqrt{x^2} = |x|$, the equation is $3|x| + 4y = 7$ and is not linear because of the $|x|$.

3. The graphs of $2x - 3y = 3$ and $x + y = 3$ intersect in the first quadrant.

Answer:

True; solve the system of equation $2x - 3y = 3$ and $x + y = 3$ and see that the point of intersection is $\left(\frac{12}{5}, \frac{3}{5}\right)$.

4. Both $(0, 0, 0)$ and $(-3, 2, 1)$ are solutions to the system

$$\begin{aligned} x + y + z &= 0 \\ y - 2z &= 0 \\ x - 2y - z &= 0 \end{aligned}$$

Answer:

False; $x = -3$, $y = 2$, $z = -1$ does not satisfy $x - 2y - z = 0$.

5. The solution to the system

$$\begin{aligned} 2x + y &= 5 \\ x + 3y &= -4 \end{aligned}$$

consists of a pair of positive integers.

Answer:

False; the second equation, $x + 3y - 4$, is not satisified if x and y are both positive.

6. The system

$$2x + y = 0$$
$$x - 3y = 5$$

is dependent.

Answer:

False; there is only one solution, $x = \frac{4}{7}$ and $y = -\frac{8}{7}$.

7. In the solution to the following system, x and y are negative and z is positive.

$$x + y - z = 4$$
$$y + 2z = 0$$
$$3x + y = 5$$

Answer:

False; if x and y are negative, then the third equation will not be satisfied, since $3x + y$ would be negative.

Exercises 8–10 Fill in the blank so that the resulting statement is true. Lines L_1, L_2, and L_3 are given by L_1: $x - 3y = 0$, L_2: $x + 3y = 6$, L_3: $x - 9y = 6$.

8. Lines L_1 and L_2 intersect at _____.

Answer:

Solve $x - 3y = 0$ and $x + 3y = 6$; $x = 3$, $y = 1$ and so L_1 and L_2 intersect at $(3, 1)$.

9. Lines L_1 and L_3 intersect at _____.

Answer:

Solve $x - 3y = 0$ and $x - 9y = 6$; $x = -3$, $y = -1$ and so L_1 and L_2 intersect at $(-3, -1)$.

10. Lines L_3 and L_2 intersect at _____.

Answer:

Solve $x + 3y = 6$ and $x - 9y = 6$; $x = 6$, $y = 0$ and so L_2 and L_3 intersect at $(6, 0)$.