6.1 - Systems of Two Linear Equations, Two Unknowns

A linear equation in two variables is an equation of the form

where are and are

Example. Which of the following equations are linear?

\[ 2x - y = 3 \quad x^2 - 2y = 5 \quad \sqrt{2}x + \frac{1}{3}y = 10 \]

A point is a solution to \( ax + by = c \) if

Example. Is (2, 3), (1, 1), or both, solutions of

\[ \bullet \quad x - 3y = -7 \]

\[ \bullet \quad 2x - y = 1 \]

\[ \bullet \quad 3x + y = 4 \]

A solution to two or more equations is called a
What are the possible solution sets?

Linear equations define .

Solutions to linear equations are where .

Example. Solve the system using substitution.

\[ x - 3y = -7 \]
\[ 2x - y = 1 \]
Example. Solve using addition-subtraction (linear combinations):

\[
\begin{align*}
2x - y &= 1 \\
3x + y &= 4 \\
\end{align*}
\]

Example. Solve using linear combinations:

\[
\begin{align*}
2x - 3y &= 3 \\
-4x + 6y &= 6 \\
\end{align*}
\]
**Example.** Solve using linear combinations:

\[
\begin{align*}
4x + 6y &= 2 \\
6x + 9y &= 3
\end{align*}
\]

**Example.** Solve using linear combinations:

\[
\begin{align*}
3x - 4y &= 10 \\
7x + 5y &= 9
\end{align*}
\]
Example. Suppose a chemist has 10% and 15% acid solutions in stock. How much of each should the chemist mix if 100 mL of a 12% solution is desired?
Example. Find the equation for a parabola \( y = ax^2 + bx - 2 \) which goes through \((1, 0)\) and \((2, 6)\)
Systems of linear type

**Example.** Solve the following system:

\[ 3x^2 - 2y^2 = 10 \]
\[ 2x^2 + y^2 = 11 \]

**Example.** Solve the following system:

\[ 3\sqrt{x} + \frac{2}{y} = 12 \]
\[ -\sqrt{x} + \frac{3}{y} = 7 \]