

2. Solving simultaneous equations with three variables

Example 3

Solve the simultaneous equations:

$$\begin{array}{l} \text{(A)} \quad x + y + z = 6 \\ \text{(B)} \quad 2x + y - z = 1 \\ \text{C:} \quad 4x - 3y + 2z = 4 \end{array}$$

$$\left. \begin{array}{l} \text{(A)} \\ \text{(B)} \end{array} \right\} + \cancel{x + y + z = 6} \quad \begin{array}{r} \cancel{x + y + z = 6} \\ + 2x + y - z = 1 \\ \hline \end{array}$$

$$\begin{array}{l} 3x + 2y = 7 \quad \textcircled{1} \\ \hline \end{array}$$

$$\left. \begin{array}{l} \text{(C)} \\ \text{C:} \end{array} \right\} + 2 \cancel{4x - 3y + 2z = 4} \quad \begin{array}{r} \cancel{4x - 3y + 2z = 4} \\ 4x + 2y - 2z = 2 \\ \hline \end{array}$$

$$\begin{array}{l} 8x - y = 6 \quad \textcircled{2} \\ \hline \end{array}$$

$$\begin{array}{l} \textcircled{1} \\ 2 \textcircled{2} \end{array} \quad \begin{array}{r} 3x + 2y = 7 \\ 16x - 2y = 12 \\ \hline 19x = 19 \\ x = 1 \end{array}$$

$$\begin{array}{l} \textcircled{2} \\ \textcircled{1} \end{array} \quad \begin{array}{r} 8(1) - y = 6 \\ 8 - y = 6 \\ y = 2 \end{array}$$

$$\begin{array}{l} \textcircled{A} \\ \textcircled{1} + \textcircled{2} + \textcircled{3} = 6 \\ 3 + z = 6 \\ z = 3 \end{array}$$

$$\text{pt } (1, 2, 3)$$

5. Solve the following equations with three unknowns.

$$\begin{array}{l} \text{(i)} \quad \begin{array}{l} 2x + y + z = 8 \\ 5x - 3y + 2z = 3 \\ 7x + y + 3z = 20 \end{array} \quad \begin{array}{l} \textcircled{1} \\ \textcircled{2} \\ \textcircled{3} \end{array} \end{array}$$

eliminate
the Z's

$$\begin{array}{r} \textcircled{2} \\ -2\textcircled{1} \end{array} \quad \begin{array}{r} 5x - 3y + 2z = 8 \\ -4x - 2y - 2z = -16 \\ \hline x - 5y = -13 \quad \textcircled{4} \end{array}$$

$$\begin{array}{r} \textcircled{3} \\ -3\textcircled{1} \end{array} \quad \begin{array}{r} 7x + y + 3z = 20 \\ -6x - 3y - 3z = -24 \\ \hline x - 2y = -4 \quad \textcircled{5} \end{array}$$

Solve for x and y

$$\begin{array}{r} \textcircled{4} \\ -\textcircled{5} \end{array} \quad \begin{array}{r} x - 5y = -13 \\ -x + 2y = 4 \\ \hline -3y = -9 \Rightarrow y = 3 \end{array}$$

Sub into $\textcircled{5}$

$$x - 2(3) = -4 \Rightarrow x - 6 = -4 \Rightarrow x = 2$$

Sub into $\textcircled{1}$

$$\begin{array}{l} 2(2) + 3 + z = 8 \\ 4 + 3 + z = 8 \\ 7 + z = 8 \Rightarrow z = 1 \end{array}$$

Answer

$$\text{pt } (2, 3, 1)$$