

5.6 Solving Linear Systems in 3 Variables

Eliminate "z" from the following equations

$$3x - 4y + 5z = 10$$

$$2x - 3y + z = 0 \quad \times 5$$

$$\begin{array}{r} 10x - 15y + 5z = 0 \\ 3x - 4y + 5z = 10 \\ \hline \end{array}$$

$$7x - 11y = -10$$

$$\begin{array}{l} \downarrow \\ 2x + 7y - 5z = 4 \\ x + 4y - 2z = 6 \end{array} \left. \vphantom{\begin{array}{l} 2x + 7y - 5z = 4 \\ x + 4y - 2z = 6 \end{array}} \right\} \times 2$$

$$\begin{array}{r} 2x + 7y - 5z = 4 \\ 2x + 8y - 4z = 12 \\ \hline \end{array}$$

$$\begin{array}{r} -1y - 1z = -8 \\ +y + z = 8 \end{array}$$

Eliminate one variable from the following pair of equations

$$4x + 3y + 10z = 6$$

$$3x - 7y + 2z = -8$$

We are now going to solve systems of equations containing 3 variables and 3 equations. We use the same methods as before BUT we have to carry them out more times.

Steps:

1. Use addition and subtraction to eliminate one variable in 2 of the equations
2. Use addition and subtraction to eliminate the same variable in 2 different equations
3. Take your resulting two equations and solve the system of equations

$$\begin{array}{r} x + y + z = 7 \quad (1) \\ x + 3y - z = 6 \quad (2) \\ x - y + 2z = 9 \quad (3) \end{array} \quad \begin{array}{r} - \\ x + y + z = 7 \\ x + 3y - z = 6 \\ \hline (4) \quad -2y + 2z = 1 \end{array}$$

$$\begin{array}{r} x + 3y - z = 6 \\ x - y + 2z = 9 \\ \hline (5) \quad 4y - 3z = -3 \end{array}$$

$$(5) \quad 4y - 3z = -3$$

$$(4) \quad -2y + 2z = 1 \quad \times 2$$

$$\begin{array}{r} -4y + 4z = 2 \\ + \quad 4y - 3z = -3 \\ \hline (6) \quad z = -1 \end{array}$$

$$(6) \quad z = -1$$

$$x + \left(\frac{-3}{2}\right) + (-1) = 7$$

$$x - 2.5 = 7$$

$$(7) \quad x = 9.5$$

$$(9.5, \frac{-3}{2}, -1)$$

$$2x - 3y + 4z = 10 \quad \textcircled{1}$$

$$x + y + z = 9 \quad \textcircled{2}$$

$$3x + 3y - 2z = 7 \quad \textcircled{3}$$

$$\begin{array}{r} 2x - 3y + 4z = 10 \\ 4x + 4y + 4z = 36 \\ \hline \textcircled{4} -2x - 7y = -26 \end{array}$$

$$\begin{array}{r} 3x + 3y - 2z = 7 \\ + 2x + 2y + 2z = 18 \\ \hline \end{array}$$

$$\textcircled{5} \quad 5x + 5y = 25$$

$$\underline{(1.8, 3.2, 4)}$$

An object is dropped from the roof of a building. The height, H metres, of the falling object after " t " seconds is

$$H = 0.5at^2 + bt + c$$

where a is the acceleration due to gravity, b is the starting velocity and c is the starting height.

The height was 70.1 m after 1 sec, 45.4 m after 2 sec and 10.9 m after 3 sec. Determine the values of a , b and c .

Assignment: Pg 341 3, 5, 7 odds
9, 11

Pg. 347 5-7 Using technology