



Chapter 6 Determinants Ex 6.4 Q13

$$\text{Let } D = \begin{vmatrix} 6 & 1 & -3 \\ 1 & 3 & -2 \\ 2 & 1 & 4 \end{vmatrix}$$

$$\begin{aligned} \text{Expanding along } R_1 \\ &= 6(14) - 1(8) - 3(-5) \\ &= 84 - 8 + 15 = 91 \end{aligned}$$

$$\text{Also } D_1 = \begin{vmatrix} 5 & 1 & -3 \\ 5 & -3 & -2 \\ 8 & 1 & 4 \end{vmatrix}$$

$$\begin{aligned} \text{Expanding along } R_1 \\ &= 5(14) - 1(36) - 3(-19) = 70 - 36 + 57 = 91 \end{aligned}$$

$$\text{Again } D_2 = \begin{vmatrix} 6 & 5 & -3 \\ 1 & 5 & -2 \\ 2 & 8 & 4 \end{vmatrix}$$

$$\begin{aligned} \text{Expanding along } R_1 \\ &= 6(36) - 5(8) - 3(-2) = 216 - 40 + 6 = 182 \end{aligned}$$

$$\text{Also } D_3 = \begin{vmatrix} 6 & 1 & 5 \\ 1 & 3 & 5 \\ 2 & 1 & 8 \end{vmatrix}$$

$$\begin{aligned} \text{Expanding along } R_1 \\ &= 6(19) - 1(-2) + 5(-5) = 114 + 2 - 25 = 91 \end{aligned}$$

$$\text{Now } x = \frac{D_1}{D} = \frac{91}{91} = 1$$

$$y = \frac{D_2}{D} = \frac{182}{91} = 2$$

$$\text{Also } z = \frac{D_3}{D} = \frac{91}{91} = 1$$

$$\text{Hence } x = 1, y = 2, z = 1$$

$$\text{Let } D = \begin{vmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{vmatrix}$$

Expanding along R_1

$$= 1(1) - 1(-1) + 0(-1) = 1 + 1 + 0 = 2$$

$$\text{Also } D_1 = \begin{vmatrix} 5 & 1 & 0 \\ 3 & 1 & 1 \\ 4 & 0 & 1 \end{vmatrix}$$

Expanding along R_1

$$= 5(1) - 1(-1) + 0(-4) = 5 + 1 + 0 = 6$$

$$\text{Again } D_2 = \begin{vmatrix} 1 & 5 & 0 \\ 0 & 3 & 1 \\ 1 & 4 & 1 \end{vmatrix}$$

Expanding along R_1

$$= 1(-1) - 5(-1) + 0(-3) = -1 + 5 + 0 = 4$$

$$\text{Also } D_3 = \begin{vmatrix} 1 & 1 & 5 \\ 0 & 1 & 3 \\ 1 & 0 & 4 \end{vmatrix}$$

$$= 1(4) - 1(-3) + 5(-1) = 4 + 3 - 5 = 2$$

$$\text{Now } x = \frac{D_1}{D} = \frac{6}{2} = 3$$

$$y = \frac{D_2}{D} = \frac{4}{2} = 2$$

$$z = \frac{D_3}{D} = \frac{2}{2} = 1$$

Hence $x = 3, y = 2, z = 1$

Chapter 6 Determinants Ex 6.4 Q15

$$\text{Let } D = \begin{vmatrix} 0 & 2 & -3 \\ 1 & 3 & 0 \\ 3 & 4 & 0 \end{vmatrix}$$

Expanding along R_1

$$= 0(0) - 2(0) - 3(-5) = 15$$

$$\text{Also } D_1 = \begin{vmatrix} 0 & 2 & -3 \\ -4 & 3 & 0 \\ 3 & 4 & 0 \end{vmatrix}$$

Expanding along R_1

$$= 0(0) - 2(0) - 3(-25) = 75$$

$$\text{Again } D_2 = \begin{vmatrix} 0 & 0 & -3 \\ 1 & -4 & 0 \\ 3 & 3 & 0 \end{vmatrix}$$

Expanding along R_1

$$= 0(0) - 0(0) - 3(15) = -45$$

$$\text{Also } D_3 = \begin{vmatrix} 0 & 2 & 0 \\ 1 & 3 & -4 \\ 3 & 4 & 3 \end{vmatrix}$$

$$= 0(25) - 2(15) + 0(1) = -30$$

$$\text{Now } x = \frac{D_1}{D} = \frac{75}{15} = 5$$

$$y = \frac{D_2}{D} = \frac{-45}{15} = -3$$

$$z = \frac{D_3}{D} = \frac{-30}{15} = -2$$

Hence $x = 5, y = -3, z = -2$

Chapter 6 Determinants Ex 6.4 Q16

$$\begin{aligned}\text{Here } D &= \begin{vmatrix} 5 & -7 & 1 \\ 6 & -8 & -1 \\ 3 & 2 & -6 \end{vmatrix} &= 5(48 + 2) + 7(-33) + 1(36) \\ &= 250 - 231 + 36 = 55\end{aligned}$$

$$\begin{aligned}D_1 &= \begin{vmatrix} 11 & -7 & 1 \\ 15 & -8 & -1 \\ 7 & 2 & -6 \end{vmatrix} &= 11(50) + 7(-83) + 1(86) \\ &= 550 - 581 + 86 = 55\end{aligned}$$

$$\begin{aligned}D_2 &= \begin{vmatrix} 5 & 11 & 1 \\ 6 & 15 & -1 \\ 3 & 7 & -6 \end{vmatrix} &= 5(-83) - 11(-33) + 1(-3) \\ &= -415 + 363 - 3 = -55\end{aligned}$$

$$\begin{aligned}D_3 &= \begin{vmatrix} 5 & -7 & 11 \\ 6 & -8 & 15 \\ 3 & 2 & 7 \end{vmatrix} &= 5(-86) + 7(-3) + 11(36) \\ &= -430 - 21 + 396 \\ &= -55\end{aligned}$$

$$\begin{aligned}\text{Now } x &= \frac{D_1}{D} = \frac{55}{55} = 1 \\ y &= \frac{D_2}{D} = \frac{-55}{55} = -1 \\ z &= \frac{D_3}{D} = \frac{-55}{55} = -1\end{aligned}$$

Hence $x = 1, y = -1, z = -1$

Chapter 6 Determinants Ex 6.4 Q17

$$2x - 3y - 4z = 29$$

$$-2x + 5y - z = -15$$

$$3x - y + 5z = -11$$

From the given system of equation we have

$$D = \begin{vmatrix} 2 & -3 & 4 \\ -2 & 5 & -1 \\ 3 & -1 & 5 \end{vmatrix} = 2(25 - 1) + 3(-10 + 3) + 4(2 - 15) = 48 - 21 - 52 = -25$$

$$D_1 = \begin{vmatrix} 29 & -3 & 4 \\ -15 & 5 & -1 \\ 11 & -1 & 5 \end{vmatrix} = 29(25 - 1) + 3(-75 + 11) + 4(15 - 55) = 696 - 192 - 160 = 344$$

$$D_2 = \begin{vmatrix} 2 & 29 & 4 \\ -2 & -15 & -1 \\ 3 & 11 & 5 \end{vmatrix} = 2(-75 + 11) - 29(-10 + 3) + 4(-22 + 45) = -128 + 203 + 92 = 167$$

$$D_3 = \begin{vmatrix} 2 & -3 & 29 \\ -2 & 5 & -15 \\ 3 & -1 & 11 \end{vmatrix} = 2(55 - 15) + 3(-22 + 45) + 29(2 - 15) = 80 + 69 - 377 = -228$$

So, by Cramer's Rule, we obtain

$$x = \frac{D_1}{D} = -\frac{344}{25}$$

$$y = \frac{D_2}{D} = -\frac{167}{25}$$

$$z = \frac{D_3}{D} = \frac{228}{25}$$

Note: Answer given in the book is incorrect.

Chapter 6 Determinants Ex 6.4 Q18

$$\text{Here } D = \begin{vmatrix} 1 & 1 & 0 \\ 1 & 0 & 1 \\ 1 & -1 & -2 \end{vmatrix} = 1(1) - 1(-3) = 1 + 3 = 4$$

$$D_1 = \begin{vmatrix} 1 & 1 & 0 \\ -6 & 0 & 1 \\ 3 & -1 & -2 \end{vmatrix} = 1(1) - 1(9) = -8$$

$$D_2 = \begin{vmatrix} 1 & 1 & 0 \\ 1 & -6 & 1 \\ 1 & 3 & -2 \end{vmatrix} = 1(9) - 1(-3) = 12$$

$$D_3 = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1 & -6 \\ 1 & -1 & 3 \end{vmatrix} = 1(-6) - 1(9) + 1(-1) = -6 - 9 - 1 = -16$$

$$\text{Now } x = \frac{D_1}{D} = \frac{-8}{4} = -2$$

$$y = \frac{D_2}{D} = \frac{12}{4} = 3$$

$$z = \frac{D_3}{D} = \frac{-16}{4} = -4$$

Hence $x = -2, y = 3, z = -4$

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