

(Step:-2) let $x_0 = 2.24615$ $x_1 = 3$
 $f(x_0) = -6.54605$ $f(x_1) = 49$

$$x_2 = \frac{2.24615 \times 49 + 3 \times 6.54605}{49 + 6.54605} = 2.33499$$

$$f(2.33499) = -2.27375$$

(Step:-3) let $x_0 = 2.33499$ $x_1 = 3$
 $f(x_0) = -2.27375$ $f(x_1) = 49$

$$x_2 = \frac{2.33499 \times 49 + 3 \times 2.27375}{49 + 2.27375} = 2.36448$$

$$f(2.36448) = -0.743339$$

(Step:-4) let $x_0 = 2.36448$ $x_1 = 3$
 $f(x_0) = -0.743339$ $f(x_1) = 49$

$$x_2 = \frac{(2.36448 \times 49 + 3 \times 0.743339)}{49 + 0.743339}$$

$$x_2 = 2.37397$$

$$f(2.37397) = -0.24225$$

(Step:-5) let $x_0 = 2.37397$ $x_1 = 3$
 $f(x_0) = -0.24225$ $f(x_1) = 49$

$$x_2 = \frac{49 \times 2.37397 + 3 \times 0.24225}{49 + 0.24225}$$

$$x_2 = 2.37704$$

$$f(2.37704) = -0.07389$$

(Step-6) let $x_0 = 2.37704$
 $f(x_0) = -0.07389$

$x_1 = 3$
 $f(x_1) = 49$

$$x_2 = \frac{49 \times 2.37704 + 3 \times 0.07389}{49 + 0.07389}$$

$$x_2 = 2.377977$$

Hence the correct decimal places
 upto three decimal places is
 2.377

Question :- 53

$$f(x) = x^4 - 32 = 0$$

$$\text{At } x=2 \Rightarrow f(2) = -16 \quad (-ve)$$

$$x=3 \Rightarrow f(3) = 49 \quad (+ve)$$

As the sign changes from $f(2)$ to $f(3)$
 ∴ The root must lie between $(2, 3)$

$$\text{Now } f'(x) = 4x^3.$$

$$\text{Now let } x_0 = 3$$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 2.54629$$

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} = 2.39429$$

$$x_3 = x_2 - \frac{f(x_2)}{f'(x_2)} = 2.37857$$

$$\textcircled{0} \quad x_4 = x_3 - \frac{f(x_3)}{f'(x_3)} = 2.378414$$

$$x_5 = x_4 - \frac{f(x_4)}{f'(x_4)} = 2.378414$$

Hence the correct decimal places upto
 4 decimal places is 2.3784

Question: 54 =

$$f(x) = x^3 - 17 = 0$$

$$\text{at } x=0 \Rightarrow f(0) = -17$$

$$x=1 \Rightarrow f(1) = -16$$

$$x=2 \Rightarrow f(2) = -9$$

$$x=3 \Rightarrow f(3) = 10$$

(-ve) } sign
(+ve) } changes

Hence the roots must lie b/w (2,3)

Question: 55 :-

$$x = 32.265$$

$$x' = 32.26$$

{ correct up to 2 decimal places }

$$y = 0.002358$$

$$y' = 0.00$$

Question: 19

$$\begin{bmatrix} 2 & 3 & -1 \\ 4 & 4 & -3 \\ -2 & 3 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 5 \\ 3 \\ 1 \end{bmatrix}$$

Now ~~A/B~~ $[A|B]$

$$\left[\begin{array}{ccc|c} 2 & 3 & -1 & 5 \\ 4 & 4 & -3 & 3 \\ -2 & 3 & -1 & 1 \end{array} \right] \quad \text{Apply: } R_3 \rightarrow R_3 + R_1$$

$$\left[\begin{array}{ccc|c} 2 & 3 & -1 & 5 \\ 4 & 4 & -3 & 3 \\ 0 & 6 & -2 & 6 \end{array} \right] \quad \text{Apply } R_2 \rightarrow R_2 - 2R_1$$

$$\left[\begin{array}{ccc|c} 2 & 3 & -1 & 5 \\ 0 & -2 & -1 & -7 \\ 0 & 6 & -2 & 6 \end{array} \right] \quad \text{Apply } R_3 \rightarrow R_3/2 \text{ then } R_1 \rightarrow R_1 - R_3$$

$$\left[\begin{array}{ccc|c} 2 & 3 & -1 & 5 \\ 0 & -2 & -1 & -7 \\ 0 & 3 & -1 & 3 \end{array} \right]$$

$$\left[\begin{array}{ccc|c} 2 & 0 & 0 & 2 \\ 0 & -2 & -1 & -7 \\ 0 & 3 & -1 & 3 \end{array} \right] \quad \text{Apply } R_1 \rightarrow R_1/2 \text{ and } R_2 \rightarrow R_2 + R_3$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & -2 & -4 \\ 0 & 3 & -1 & 3 \end{array} \right] \quad \text{Apply } R_3 \rightarrow R_3 - 3R_2$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & -2 & -4 \\ 0 & 0 & 5 & 15 \end{array} \right] \quad \text{APPLY } R_3 \rightarrow R_3/5$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & -2 & -4 \\ 0 & 0 & 1 & 3 \end{array} \right] \quad \text{APPLY } R_2 \rightarrow R_2 + 2R_3$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{array} \right]$$

Q50

$$x + y + z = 9$$

$$2x - 3y + 4z = 13$$

$$3x + 4y + 5z = 40$$

$$AX = B \quad \begin{bmatrix} 1 & 1 & 1 \\ 2 & -3 & 4 \\ 3 & 4 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 9 \\ 13 \\ 40 \end{bmatrix}$$

Augmented matrix $[A:B]$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 9 \\ 2 & -3 & 4 & 13 \\ 3 & 4 & 5 & 40 \end{array} \right]$$

apply $R_2 \rightarrow R_2 - 2R_1$ and $R_3 \rightarrow R_3 - 3R_1$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 9 \\ 0 & -5 & 2 & -5 \\ 0 & 1 & 2 & 13 \end{array} \right]$$

$$R_2 \rightarrow R_2 + R_3$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 9 \\ 0 & -6 & 0 & -18 \\ 0 & 1 & 2 & 13 \end{array} \right] \quad \text{Apply } R_2 \Rightarrow R_2/6$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 9 \\ 0 & -1 & 0 & -3 \\ 0 & 1 & 2 & 13 \end{array} \right] \quad \text{Apply } R_1 \rightarrow R_1 + R_2 \text{ and } R_3 \rightarrow R_3 + R_2$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 1 & 6 \\ 0 & -1 & 0 & -3 \\ 0 & 0 & 2 & 10 \end{array} \right] \quad \text{Apply } R_2 \rightarrow (-1)R_2 \text{ and } R_1 \rightarrow R_1 - R_3/2$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 2 & 10 \end{array} \right] \quad \text{Apply } R_3 \rightarrow R_3/2$$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 5 \end{array} \right] \quad \text{Ans}$$

$$R_2 = 5S + 1P + 1C$$

$$R_1 = 5S + 1P + 1C$$

$$R_3 = 20S + 0P + 10C$$

$$\left[\begin{array}{ccc|c} 1 & 5 & 1 & 1 \\ 0 & 5 & 1 & 3 \\ 0 & 20 & 10 & 5 \end{array} \right] \quad \text{Ans}$$

$$\left\{ \begin{array}{l} 0 = 5 - 10 \\ 0 = 5 - 10 \end{array} \right\}$$

(Question :- 59)

Basic formula

$$a_1x + b_1y + c_1z = d_1$$

$$a_2x + b_2y + c_2z = d_2$$

$$a_3x + b_3y + c_3z = d_3$$

$$\therefore x = \frac{1}{a_1} [d_1 - b_1y - c_1z]$$

$$y = \frac{1}{b_2} [d_2 - a_2x - c_2z]$$

$$z = \frac{1}{c_3} [d_3 - a_3x - b_3y]$$

(Solution 59)

~~$$x + y + z = 9$$~~

~~$$2x - 3y + 4z = 13$$~~

$$45x + 2y + 3z = 58$$

$$-3x + 22y + 2z = 47$$

$$5x + y + 20z = 67$$

(Step - 1)

$$x = \frac{1}{45} [58 - 2y + 3z] = \frac{1}{45} [58]$$

$$\left\{ \begin{array}{l} y = z = 0 \end{array} \right\}$$

$$\boxed{x = 1.2888}$$

$$\Rightarrow y = \frac{1}{22} [47 + 3x - 2z] \quad \left\{ \begin{array}{l} z=0 \\ x=1.2888 \end{array} \right\}$$

$$y = \frac{1}{22} [47 + 3 \times 1.2888]$$

$$\boxed{y = 2.3121}$$

$$z = \frac{1}{20} [67 - 5x - y]$$

$$= \frac{1}{20} [67 - 5 \times 1.2888 - 2.3121]$$

$$\boxed{z = 2.9123}$$

Step:-2

$$y = 2.3121$$

$$z = 2.9123$$

$$\Rightarrow x = \frac{1}{45} [58 - 2 \times 2.3121 - 3 \times 2.9123]$$

$$= 0.99197$$

$$\boxed{x = 0.99197}$$

$$\Rightarrow y = \frac{1}{22} [47 + 3 \times 0.99197 - 2 \times 2.9123]$$

$$= 2.0068$$

$$\boxed{y = 2.0068}$$

$$\Rightarrow z = \frac{1}{20} [67 - 5 \times 0.99197 - 2 \times 2.0068]$$

$$z = 3.00166$$

Step: 3 $\Rightarrow y = 2.0068 \quad Z = 3.0068$

$$\Rightarrow x = \frac{1}{45} [58 - 2 \times 2.0068 - 3 \times 3.0068]$$

$$x = 0.99958$$

$$\Rightarrow y = \frac{1}{22} [47 + 3 \times 0.99958 - 2 \times 2.0068]$$

$$y = 2.09023$$

$$\Rightarrow z = \frac{1}{20} [67 - 5 \times 0.99958 - 2 \times 2.09023]$$

$$z = 2.9955$$

Ans