

Q. Find the real root of the eqⁿ.

$$f(x) = x^3 - x - 1 = 0$$

Solⁿ:

$$f(-1) = -1 + 1 - 1 = -1$$

$$f(1) = 1 - 1 - 1 = -1$$

$$f(2) = 8 - 2 - 1 = 5$$

Let,

$$x_1 = \frac{1+2}{2} = 1.5$$

$$\text{Then } f(x_1) = 1.5^3 - 1.5 - 1 = 9/8 > 0$$

$$x_2 = \frac{1 + 1.5}{2} = 1.25$$

$$\therefore f(x_2) = 1.25^3 - 1.25 - 1 = -\frac{17}{64} < 0$$

$$x_3 = \frac{1.25 + 1.5}{2} = 1.375$$

$$\therefore f(x_3) = +ve$$

$$x_4 = \frac{1.25 + 1.375}{2} = 1.3125$$

$$\therefore f(x_4) = -0.05 < 0$$

$$\therefore x_5 = \frac{1.3125 + 1.375}{2} = 1.3437$$

$$\therefore f(x_5) = 0.08 > 0$$

$$x_6 = \frac{1.3125 + 1.3437}{2} = 1.3281$$

$$\therefore f(x_6) = 0.01 > 0$$

$$x_7 = \frac{1.3125 + 1.3281}{2} = 1.3203$$

$$\therefore f(x_7) = -0.01 < 0$$

$$x_8 = \frac{1.3203 + 1.3281}{2} = 1.3242$$

$$\therefore f(x_8) = -0.002 < 0$$

$$\therefore x_9 = \frac{1.3242 + 1.3281}{2} = 1.326$$

$$\therefore f(x_9) = 0.005$$

$$\therefore \text{root} \approx 1.32$$