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*Where Minds Pollinate*

**Class 12**  
**Mathematics**

**Chapter 10**

**Review Exercise 10**

**Handwritten Solution**

**Follow Our Socials**

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# Review Ex 10

Q2 falsi  $2e^x \sin x = 5$

$$2e^x \sin x - 5 = 0$$

$$f(x) = 2e^x \sin x - 5$$

$x_0 = 1, x_1 = 2$  i.e. root lies in interval  $[1, 2]$ .

$$f(1) = 2e^1 \sin(1) - 5 = -0.4253 < 0$$

$$f(2) = 2e^2 \sin(2) - 5 = 8.4377 > 0$$

Regular falsi method  $[1, 2]$

$$x_1 = \frac{1(8.4377) - 2(-0.4253)}{8.4377 - (-0.4253)} \Rightarrow 1.0479$$

$$f(x_1) = 2e^{1.0479} \sin(1.0479) - 5 \Rightarrow -0.0588 < 0$$

so  $[1.0479, 2]$

$$x_2 = \frac{(1.0479)(8.4377) - 2(-0.0588)}{8.4377 - (-0.0588)}$$

$$x_2 = 1.0545$$

$$f(x_2) = 2e^{1.0545} \sin(1.0545) - 5 = -0.0073 < 0$$

so  $[1.0545, 2]$

$$x_3 = \frac{(1.0545)(8.4377) - 2(-0.0073)}{8.4377 - (-0.0073)} = 1.0553$$

$$f(x_3) = 2e^{1.0553} \sin(1.0553) - 5$$

$$= -0.0009 < 0 \quad \text{so } [1.0553, 2]$$

$$x_4 = \frac{(1.0553)(8.4377) - 2(-0.0009)}{8.4377 - (-0.0009)}$$

$$= 1.05542$$

hence upto three decimal

equation is 1.055

Q3) Solution,  $f(x) = 4x^3 - \sin x - e^x$

$$f(0) = 4(0)^3 - \sin(0) - e^0 = -1 < 0$$

$$f(1) = 4(1)^3 - \sin(1) - e^1 = 0.440 > 0$$

new bisection interval  $[0, 1]$

$$x_0 = \frac{0+1}{2} = 0.5$$

$$f(x_0) = f(0.5) = 4(0.5)^3 - \sin(0.5) - e^{0.5} = -1.628 < 0 \quad \text{so } [0.5, 1]$$

$$x_1 = \frac{0.5+1}{2} = 0.75$$

$$f(x_1) = 4(0.75)^3 - \sin(0.75) - e^{0.75} = -1.111 < 0 \quad \text{so } [0.75, 1]$$

$$x_2 = \frac{0.75+1}{2} = 0.875$$

$$f(x_2) = 4(0.875)^3 - \sin(0.875) - e^{0.875} = -0.48 < 0 \quad \text{so } [0.875, 1]$$

$$x_3 = \frac{0.875+1}{2} = 0.9375$$

$$f(x_3) = 4(0.9375)^3 - \sin(0.9375) - e^{0.9375} = -0.063 < 0 \quad \text{so } [0.9375, 1]$$

up  $n=4$

$$x_4 = \frac{0.9375+1}{2} = 0.9687$$

$$x_4 = 8(0.9687)^2 \sin(0.9687) - e^{0.9687}$$

$$= 0.9687 > 0 \quad \text{so } [0.9375, 0.9687]$$

$$x_5 = \frac{0.9375 + 0.9531}{2} = 0.9453$$

$$f(x_5) = 4(0.9375)^3 - \sin(0.9531) - e^{0.9531} = +0.054 > 0$$

So  $[0.9375 - 0.9531]$

$$x_6 = \frac{0.9375 + 0.9531}{2} = 0.9453$$

$$f(x_6) = 4(0.9453)^3 - \sin(0.9453) - e^{0.9453}$$

$$= -0.005 < 0 \quad \text{So } [0.9453, 0.9531]$$

$$x_7 = \frac{0.9453 + 0.9531}{2} = 0.9492$$

So upto two decimal root of eq is 0.94

04)  $f(x) = -4x + \cos x + 2$

$$f(x_n) = -4x_n + \cos x_n + 2$$

$$f'(x_n) = -4 - \sin x_n$$

$$x_{n+1} = x_n - \frac{-4x_n + \cos x_n + 2}{-4 - \sin x_n}$$

$$x_{n+1} = \frac{4x_n + x_n \sin x_n - 4x_n + \cos x_n + 2}{4 + \sin x_n}$$

$n=0$

$$x_1 = \frac{0.5 \sin 0.5 + \cos 0.5 + 2}{4 + \sin 0.5} = 0.695914$$

$n=1$

$$x_2 = \frac{(0.695914) \sin(0.695914) + \cos(0.695914) + 2}{4 + \sin(0.695914)}$$

$$= 0.692426$$

put  $n=2$

$$x_3 = \frac{0.692426 \sin(0.692426) + \cos(0.692426) + 2}{4 + 8 \ln(0.692426)}$$
$$= 0.692425$$

Q5)

$$h=4$$

$$x_0=0; x_1=1 \quad x_2=2 \quad x_3=3$$

By Trapezoidal rule

$$\int_0^3 f(x) dx = \frac{h}{2} [f(x_0) + 2(f(x_1) + f(x_2)) + f(x_3)]$$

$$\int_0^3 f(x) dx = \frac{1}{2} [1 + 2(0.5) + 0.2] + 0.1$$
$$= \boxed{1.25}$$

Q6) let the time be represented by variable  $x$  and the corresponding speed is  $f(x)$ .

$$\text{difference} = 0.2$$

$$x_0=0 \quad f(x_0)=f(0)=0$$

$$x_1=0.2 \quad f(x_1)=f(0.2)=5$$

$$x_2=0.4 \quad f(x_2)=f(0.4)=12$$

$$x_3=0.6 \quad f(x_3)=f(0.6)=24$$

$$x_4=0.8$$

$$; \quad f(x_4)=f(0.8)=30$$

$$x_5=1$$

$$; \quad f(x_5)=f(1)=32$$

$$x_6=1.2$$

$$; \quad 20$$

$$x_7=1.4$$

$$; \quad 12$$

$$x_8=1.6$$

$$; \quad 5$$

$$x_9 = 1.8$$

$$; \quad 2$$

$$x_{10} = 2$$

$$; \quad 0$$

Total distance covered in two hours is  $\int_0^2 f(x) dx$

By Simpson's rule.

$$\int_0^2 f(x) dx = \frac{0.2}{3} [0 + 4(5 + 24 + 32 + 12 + 2) + 2(12 + 30 + 20 + 5)]$$

$$\int_0^2 f(x) dx = \frac{0.2}{3} [4(75) + 2(67)]$$

$$= \frac{0.2}{3} (434) \approx 28.9333 \text{ kms} \quad \checkmark$$