

Answer to the question no-1

$$f(x) = e^{0.5x} + \sin x \quad [0, 2]$$

$$I(f) = \int_0^2 (e^{0.5x} + \sin x) dx$$

$$= 4.8527 \quad (\text{Ans})$$

$$\begin{aligned} \frac{2}{I_n(f)} &= \frac{b-a}{2} [f(a) + f(b)] \\ &= \frac{2-0}{2} [1 + 3.6276] \\ &= 4.6276 \end{aligned}$$

$$\begin{aligned} \text{here,} \\ a &= 0 \\ b &= 2 \\ f(a) &= e^{0.5 \times 0} + \sin 0 \\ &= 1 \\ f(b) &= e^{0.5 \times 2} + \sin 2 \\ &= 3.6276 \end{aligned}$$

$$\text{Relative percentage error, } \left| \frac{I(f) - I_n(f)}{I(f)} \right| \times 100\% \quad I(f) = 4.8527$$

$$= \left| \frac{4.8525 - 4.6276}{4.8525} \right| \times 100\%$$

$$= 4.6347\% \quad (\text{Ans})$$

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$$f(x) = e^{0.5x} + \sin x$$

Given, $m = 4$

$$\therefore h = \frac{b-a}{m} = \frac{2-0}{4} = 0.5$$

$$\therefore x_0 = a = 0$$

$$x_1 = x_0 + h = 0.5$$

$$x_2 = x_1 + h = 1$$

$$x_3 = x_2 + h = 1.5$$

$$x_4 = b = 2$$

$$\begin{aligned} f(0.5) &= e^{0.5 \times 0.5} + \sin(0.5) \\ &= 1.7634 \\ f(1) &= 2.4901 \\ f(1.5) &= 3.1145 \end{aligned}$$

Now,

$$C_{1,4}(f) = \frac{h}{2} [f(a) + 2f(x_1) + 2f(x_2) + 2f(x_3) + f(b)]$$

$$= \frac{0.5}{2} [1 + 2 \times 1.7634 + 2 \times 2.4901 + 2 \times 3.1145 + 3.6274]$$

$$= \frac{0.5}{2} [1 + (2 \times 1.7634) + (2 \times 2.4901) + (2 \times 3.1145) + 3.6274]$$

$$= 4.84089$$

$$\text{Relative percentage error, } \left| \frac{I(f) - C_{1,4}(f)}{I(f)} \right| \times 100\%$$

$$= \left| \frac{4.8527 - 4.8409}{4.8527} \right| \times 100\%$$

$$= 0.24\%$$

(Ans)

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from "3"
 $f(1) = 2.4901$

when $n=2$,

$$I_2(f) = \frac{b-a}{6} \left[f(a) + 4 \frac{f(a+b)}{2} + f(b) \right]$$

$$= \frac{2-0}{6} \left[f(0) + 4 f(1) + f(2) \right]$$

$$= \frac{1}{3} \left[1 + 4 \times 2.4901 + 3.6276 \right]$$

$$= 4.8627$$

$$\therefore \text{Relative percentage error} = \left| \frac{I(f) - I_2(f)}{I(f)} \right| \times 100\%$$

$$= \left| \frac{4.8527 - 4.8627}{4.8527} \right| \times 100\%$$

$$= 0.206\%$$

(Ans)