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Name CHANDRAKANT DAS

Standard 2nd Sem Division Elec. Roll No. 12

Subject Math's Assignment

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Set A

Q.: Trape zoidal Rule $\int_0^1 \frac{x^2}{1+x^3}\,dx$

Sol.-

Here - $a = 0, \quad b = 1, \quad n = 10$

$$h = \frac{b-a}{n} = \frac{1-0}{10} = 0.1$$

$$f(x) = \frac{x^2}{1+x3}$$

x	$F(x)\ \frac{x^2}{1+x^3}$	y
0	$\frac{0^2}{1+0^3} = 0$	y_0
0.1	$\frac{0.1^2}{1+0.1^3} = 0.9990$	y_1
0.2	$\frac{0.2^2}{1+0.2^3} = 0.0396$	y_2
0.3	$\frac{x^2}{1+x^3} = 0.0876$	y_3
0.4	$\frac{x^2}{1+x^3} = 0.1503$	y_4
0.5	$\frac{x^2}{1+x^3} = 0.2222$	y_5
0.6	$\frac{x^2}{1+x^3} = 0.2960$	y_6
0.7	$\frac{x^2}{1+x^3} = 0.3648$	y_7
0.8	$\frac{x^2}{1+x^3} = 0.4232$	y_8
0.9	$\frac{x^2}{1+x^3} = 0.4684$	y_9
1	$\frac{x^2}{1+x^3} = 0.5$	y_{10}

By Trapzoidal Rule

$$f(x)\ \frac{x^2}{1+x^2} = \frac{h}{2}\left[(y_0+y_{10}) + 2(y_1+y_2+y_3+y_4+y_5+y_6+y_7+y_8+y_9)\right.$$

$$= \frac{0.2}{2}\left[(0+0.5) + 2(0.9990 + 0.0396 + 0.0876 + 0.1503 + 0.2222 + 0.2960 + 0.3648 + 0.4232 + 0.4684)\right]$$

$$= \frac{0.1}{2}(0.5 + 6.1022)$$

$$\frac{0.1}{2}(6.6022) \quad 0.33011 \text{ Ans.}$$

(2)

Ans – 3

$$\int_1^5 \frac{dx}{x}$$

Sol. Here

$$a = 1, \quad b = 5, \quad n = 8$$

$$h = \frac{b-a}{n} = \frac{5-1}{8} = 0.5$$

x	$F(x) = \frac{1}{x}$	
1	$\frac{1}{1} = 1$	y_0
1.5	$1/1.5 = 0.6666$	y_1
2	$1/2.0 = 0.5$	y_2
2.5	$1/2.5 = 0.4$	y_3
3	$1/3 = 0.3333$	y_4
3.5	$1/3.5 = 0.2857$	y_5
4	$1/4 = 0.25$	y_6
4.5	$1/4.5 = 0.2222$	y_7
5	$1/5 = 0.2$	y_8

(1)

By Simpson's 3/8 Rule

$$\int_x f(x)\,dx = \frac{3h}{8}\left[(y_0+y_8)+2(y_3+y_6)+3(y_1+y_2+y_4+y_5+y_7)\right]$$

$$= \frac{3\times 0.5}{8}\left[(1+0.2)+2(0.4+0.25)+3(0.6666\ldots+0.5+0.3333+0.2857+0.2222)\right]$$

$$\frac{3\times 0.5}{8}(1.2+1.3+6.0234)$$

$$\frac{3\times 0.5}{8}(8.5234) = 1.5981 \text{ Ans.}$$

Ans – 4

$$\int_0^{\pi} \sin x\,dx$$

Sol. Here $a = 0$, $b = \pi$, $n = 10$

$$h = \frac{b-a}{n} = \frac{\pi-0}{10} = \frac{\pi}{10}$$

$f(x) = \sin x$

x	$f(x) = \sin x$	
$\pi/10 * 0 = 0$	$\sin x = 0$	y_0
$\pi/10 * 1 = \pi/10$	$\sin x = 0.3090$	y_1
$\pi/10 * 2 = \pi/5$	$\sin x = 0.5877$	y_2
$\pi/10 * 3 = 3\pi/10$	$\sin x = 0.8090$	y_3
$\pi/10 * 4 = 4\pi/10$	$\sin x = 0.9510$	y_4
$\pi/10 * 5 = \pi/2$	$\sin x = 1$	y_5
$\pi/10 * 6 = 6\pi/10$	$\sin x = 0.9510$	y_6
$\pi/10 * 7 = 7\pi/10$	$\sin x = 0.8090$	y_7
$\pi/10 * 8 = 8\pi/10$	$\sin x = 0.5877$	y_8
$\pi/10 * 9 = 9\pi/10$	$\sin x = 0.3090$	y_9
$\pi/10 * 10 = \pi/1$	$\sin x = 0$	y_{10}

By Trapezoidal Rule

$$f(x)\ \sin x = \frac{h}{2}\left[(y_0+y_{10}) + 2\left(y_1+y_2+y_3+y_4+y_5+y_6+y_7+y_8+y_9\right)\right]$$

$$\frac{\pi/10}{2}\left[(0+0) + 2\left(0.3090+0.5877+0.8090+0.9510+1+0.9510+0.8090+0.5877+0.3090\right)\right]$$

$$\frac{\pi/10}{2}(12.6268) = 1.9834 \text{ Ans.}$$

By Simpson's 1/3

$$f(x)\ \sin x = \frac{h}{3}\left[(y_0+y_{10}) + 2(y_2+y_4+y_6+y_8) + 4(y_1+y_3+y_5+y_7+y_9)\right]$$

$$\frac{\pi/10}{3} = (6.1548 + 12.944)$$

$$\frac{\pi/10}{3} \times (19.0988) = 2.0000 \text{ Ans.}$$

(4)

(7/10) Ans