



UNIT 4 INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION

NUMERICAL SINGLE INTERGRATION USING SIMPSON'S 13RD RULE

$$= \frac{1}{3} [4.04] = 1.346$$

Q. find the value of $\log_e 5$ from $\int_0^5 \frac{dx}{4x+5}$

by Simpson's $\frac{1}{3}$ rd Rule ($n=10$)

$$y(x) = \frac{1}{4x+5} \quad h = \frac{b-a}{n} = \frac{5-0}{10} = \frac{5}{10} = 0.5$$

x	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
y	0.2	0.142	0.111	0.090	0.076	0.066	0.058	0.052	0.047	0.043	0.04

By Simpson's $\frac{1}{3}$ rd Rule

$$\int_0^5 \frac{dx}{4x+5} = \frac{0.5}{3} \left[(0.2 + 0.04) + 4(0.142 + 0.090 + 0.066 + 0.052 + 0.043) + 2(0.111 + 0.076 + 0.058 + 0.047) \right]$$

$$= \frac{0.5}{3} [0.24 + 4(0.393) + 2(0.292)]$$

$$= \frac{0.5}{3} [2.396]$$

$$= 0.166 \times 2.396$$

$$= 0.397$$

$$\int_0^5 \frac{dx}{4x+5} = \left[\frac{\log(4x+5)}{4} \right]_0^5$$



SNS COLLEGE OF TECHNOLOGY
(AN AUTONOMOUS INSTITUTION)
COIMBATORE - 35



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NUMERICAL SINGLE INTERGRATION USING SIMPSON'S 13RD RULE

$$\begin{aligned} &= \left[\frac{\log(4 \times 5) + 5}{4} - \frac{\log(4 \times 0) + 5}{4} \right] \\ &= \left[\frac{\log 25}{4} - \frac{\log 5}{4} \right] = \frac{1}{4} [\log 25 - \log 5] \\ &= \frac{1}{4} \log \left(\frac{25}{5} \right) = \frac{1}{4} \log 5 \\ \frac{1}{4} \log 5 &= 0.397 \\ \log 5 &= 4 \times 0.397 = 1.588 \end{aligned}$$