



**UNIT 4 INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION**

**NUMERICAL SINGLE INTERGRATION USING SIMPSON'S 13RD RULE**

Numerical Integration by Simpson's  $\frac{1}{3}$ rd Rule:

$$\int_{x_0}^{x_n} y dx = \frac{h}{3} [(y_0 + y_n) + 4(y_1 + y_3 + y_5 + \dots + y_{n-1}) + 2(y_2 + y_4 + y_6 + \dots + y_{n-2})]$$

$$= \frac{h}{3} [A + 4B + 2C]$$

Where A is the sum of first & last ordinates

B = Sum of the odd ordinates

C = Sum of the even ordinates



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Problems  
D Evaluate  $\int_0^6 \frac{dx}{1+x^2}$  using Simpson's  $\frac{1}{3}$ rd rule with  
bequal intervals.

$$y(x) = \frac{1}{1+x^2}, \quad h = \frac{b-a}{n} = \frac{6-0}{6} = 1$$

x	0	1	2	3	4	5	6
y	1	0.5	0.2	0.1	0.05	0.03	0.02

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

$$\int_0^6 \frac{dx}{1+x^2} = \frac{1}{3} \left[ (1+0.02) + 4(0.5+0.1+0.03) + 2(0.2+0.05) \right]$$

$$= \frac{1}{3} [1.02 + 2.152 + 0.5]$$

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