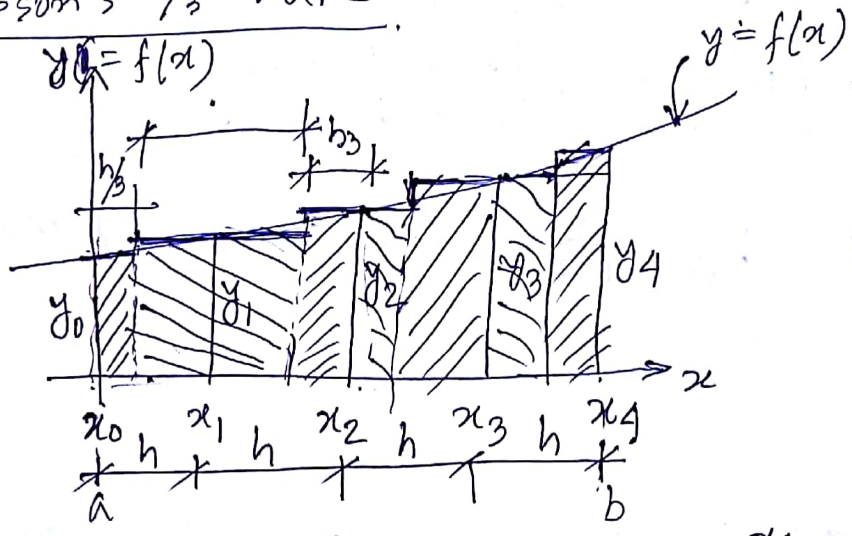
DSNM (19/03/2021)

Simpson's 1/3 rule



$$\int_{x_0}^{x_2} y\,dx = \frac{h}{3}\left(y_0 + 4y_1 + y_2\right)$$

$$\int_{x_2}^{x_4} y\,dx = \frac{h}{3}\left(y_2 + 4y_3 + y_4\right)$$

$$\int_{x_0}^{x_4} y\,dx = \frac{h}{3}\left[y_0 + 4(y_1 + y_3) + 2y_2 + y_4\right]$$

⋮

$$\int_{x_{n-2}}^{x_n} y\,dx = \frac{h}{3}\left(y_{n-2} + 4y_{n-1} + y_n\right)$$

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

$$\boxed{E_T = \frac{b-a}{180}\, h^4 y^{IV}(\bar{x})}$$

Prob

x	7.47	7.48	7.49	7.50	7.51	7.52
$y=f(x)$	1.93	1.95	1.98	2.01	2.03	2.06

find out $\int_{7.47}^{7.52} f(x)\,dx$ by applying the Trapezoidal rule.

Prob:

Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using the simpson's 1/3 rule.

Take, $h=1/6$

x	0	1/6	1/3	1/2	2/3	5/6	1
y	$\frac{1}{1+0^2}$	$\frac{1}{1+(1/6)^2}$	$\frac{1}{1+(1/3)^2}$	$\frac{1}{1+(\frac{1}{2})^2}$	$\frac{1}{1+(\frac{2}{3})^2}$	$\frac{1}{1+(5/6)^2}$	$\frac{1}{1+1^2}$

$$I = \int_0^1 \frac{dx}{1+x^2} = \frac{(1/6)}{3}\left[y_0 + 4(y_1+y_3+y_5)+2(y_2+y_4)+y_6\right]$$

$$= 0.7853978$$