

Trapezoidal's Rule

Formula:

$$I = \frac{h}{2} [f(x_0) + 2f(x_1) + 2f(x_2) + 2f(x_3) + \dots + 2f(x_{n-2}) + 2f(x_{n-1}) + f(x_n)]$$
$$= \frac{h}{2} [f(x_0) + 2\{f(x_1) + f(x_2) + f(x_3) + \dots + f(x_{n-2}) + f(x_{n-1})\} + f(x_n)]$$

$$\int_a^b f(x) dx$$

a = Lower Limit Integration

b = Upper Limit Integration

n = Number of equally spaced subintervals from a to b

$$h = x_{i+1} - x_i = \frac{b - a}{n}$$

Example: Calculate the value of integral $\int_0^6 \frac{x+1}{2} dx$ using 6 subintervals

Solution: $h = \frac{b - a}{n} = \frac{6 - 0}{6} = 1$

	x_0	x_1	x_2	x_3	x_4	x_5	x_6
x	0	1	2	3	4	5	6
$f(x)$	0.5	1.0	1.5	2.0	2.5	3.0	3.5

$$I = \frac{h}{2} [f(x_0) + 2\{f(x_1) + f(x_2) + f(x_3) + f(x_4) + f(x_5)\} + f(x_6)]$$
$$= \frac{1}{2} [0.5 + 2\{1.0 + 1.5 + 2.0 + 2.5 + 3.0\} + 3.5]$$
$$= 0.5 \times 24.0$$
$$= 12.0 \text{ (Ans)}$$