



Numerical Integration :

Gauss Quadrature method

$$\int_{-1}^1 f(x) dx = \sum_{i=1}^n w_i f(x_i)$$

w_i = Weight fn.

x_i = Predetermined sampling points.

To find no. of sampling points, $2n-1$ = Order of polynomial.

No. of sampling Points, n	Location x_i	Weight fn. w_i
1	$x_1 = 0$	$w_1 = 2$
2	$x_1 = \sqrt{\frac{1}{3}} = 0.57735$ $x_2 = -\sqrt{\frac{1}{3}} = -0.57735$	$w_1 = 1$ $w_2 = 1$
3	$x_1 = \sqrt{\frac{3}{5}} = 0.774567$ $x_2 = 0$ $x_3 = -\sqrt{\frac{3}{5}} = -0.774567$	$w_1 = \frac{5}{9} = 0.5555$ $w_2 = \frac{8}{9} = 0.8888$ $w_3 = \frac{5}{9} = 0.5555$
4	$x_1 = 0.8611363$ $x_2 = 0.339981$ $x_3 = -0.339981$ $x_4 = -0.8611363$	$w_1 = 0.347855$ $w_2 = 0.652145$ $w_3 = 0.652145$ $w_4 = 0.347855$