$$I = \int_0^2 \left(\frac{x^4}{12} - 3x^2\right) dx$$

$a = 0$
$b = 2$

$f(x) \Rightarrow \frac{x^4}{12} - 3x^2$

$x(\xi) \Rightarrow a N_1(\xi) + b N_2(\xi)$

$\Rightarrow \cancel{2}\left(\frac{1+\xi}{\cancel{2}}\right) \Rightarrow (1+\xi)$

I

$f(\xi) \Rightarrow \frac{(1+\xi)^4}{12} - 3(1+\xi)^2$

$$x \rightarrow a\overbrace{\left(\frac{1-\xi}{2}\right)}^{N_1} + b\overbrace{\left(\frac{1+\xi}{2}\right)}^{N_2}$$

$$dx \Rightarrow \underbrace{\left(\frac{b-a}{2}\right)}_{J} d\xi$$

After transformation; $I \Rightarrow J \underbrace{\int_{-1}^{1} f(\xi)\, d\xi}_{\hat{I}}$

$J = \frac{(b-a)}{2}$

$\boxed{\text{degree } (f) = 4}$ $\therefore$ $\boxed{n_{gp} = 3}$ $\because$ $\boxed{P_{max} = 5}$

Taking $n_{gp} = 3$, $\xi \rightarrow \pm 0.774596692$ $\quad 0.55556$

$0 \quad 0.88889$

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$$f(\xi)\ \xi \Rightarrow \frac{(1+\xi)^4}{12} - 3(1+\xi)^2$$

$$\Rightarrow \frac{(1+\xi^2+2\xi)^2}{12} - 3(1+\xi^2+2\xi)$$

$$\Rightarrow \frac{1+\xi^4+4\xi^2+2\xi^2+4\xi^3+4\xi}{12} - 3(1+\xi^2+2\xi)$$

$$\Rightarrow \frac{1}{12}\xi^4 + \frac{1}{2}\xi^2 + \frac{1}{3}\xi^3 + \frac{1}{3}\xi + \frac{1}{12} - 3 - 3\xi^2 - 6\xi$$

$$\Rightarrow \frac{1}{12}\xi^4 + \frac{1}{3}\xi^3 - \frac{5}{2}\xi^2 - \frac{17}{3}\xi - \frac{35}{12}$$

$$\Rightarrow \begin{bmatrix} 1 & \xi & \xi^2 & \xi^3 & \xi^4 \end{bmatrix} \begin{bmatrix} -35/12 \\ -17/3 \\ -5/2 \\ 1/3 \\ 1/12 \end{bmatrix} \rightarrow (\alpha)$$

$$M \Rightarrow \begin{bmatrix} 1 & 0.7746 & 0.6000 & 0.4647 & 0.3599 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & -0.7746 & 0.6000 & -0.4647 & 0.3599 \end{bmatrix} \begin{bmatrix} -35/12 \\ -17/3 \\ -5/2 \\ 1/3 \\ 1/12 \end{bmatrix}$$

Ans $\Rightarrow$ -7.4665

Application

$$\int_0^2 \left(\frac{x^4}{12} - 3x^2\right) dx$$

$$\Rightarrow \left[\frac{x^5}{60} - x^3\right]_0^2$$

$$\Rightarrow \left(\frac{35}{60} - 8\right) - (0)$$

$$\Rightarrow -7.41665$$

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