

Tutorial 10

Numerical integration

1. Estimate the following integral both analytically and numerically. For numerical integration use trapezoidal and Simpson's 1/3 rules by dividing the range of integration into 1, 2, 4, and 8 segments. Compute true percentage errors for numerical integration. Also calculate the ratio of errors for each successive interval sizes.

$$I = \int_0^2 \exp(x) dx$$

2. Estimate the following integral by using –

- (a) $O(h^8)$ Romberg integration and determine true and approximate percentage errors;
- (b) two- and three-point Gauss-Legendre formulas and determine true percentage error.

$$I = \int_{-2}^2 x e^{-x} dx$$

3. Estimate the following improper integral

$$I = \int_{-2}^{\infty} x e^{-x} dx$$