

NPTEL lectures on
Elementary Numerical Analysis

by

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Assignment 3

1. Use the Gauss two-point quadrature rule to approximate

$$\int_0^1 \frac{dx}{x+2}$$

and compare the result with the trapezoidal and Simpson rules.

2. Determine w_0, w_1, w_2 so that the quadrature formula

$$\int_0^{2h} x^{-1/2} f(x) dx \approx (2h)^{1/2} (w_0 f(0) + w_1 f(h) + w_2 f(2h))$$

is exact for quadratic polynomials.

3. Use the forward, central and backward difference formulae respectively to determine $f'(x_0), f'(x_1)$ and $f'(x_2)$ using the following function values:

x_i	0.5	0.6	0.7
$f(x_i)$	0.4794	0.5646	0.6442

4. If A and B are invertible matrices, then show that

$$\kappa(AB) \leq \kappa(A)\kappa(B).$$

5. Let A be an $n \times n$ invertible matrix. Show that the condition number of A with respect to the Frobenius norm

$$\kappa_F(A) \geq \sqrt{n}.$$