

Math 5601: Introduction to Numerical Analysis

Homework assignment 8

Dr. Xiaoming He*

Show all relevant work in detail to justify your conclusions. Partial credit depends upon the work you show.

Problem #1: Consider the formula

$$\int_0^h f(x) \, dx \approx h \left[Af(0) + Bf\left(\frac{h}{3}\right) + Cf(h) \right].$$

- (a) Find $A, B,$ and C such that this is exact for all polynomials of degree less than or equal to 2.
- (b) Suppose that the trapezoidal rule applied to $\int_0^2 f(x) \, dx$ gives the value $\frac{1}{2}$ while the quadrature rule in part (a) applied to $\int_0^2 f(x) \, dx$ gives the value $\frac{1}{4}$. If $f(0) = 3$, then show that $f\left(\frac{2}{3}\right) = 1$.

Problem #2: Show that

- (a) forward phase of Gauss elimination requires $\frac{1}{3}n^3 + O(n^2)$ multiplications and divisions.
- (b) back solving Gauss elimination requires $\frac{n^2+n}{2}$ multiplications and divisions.

*Department of Mathematics and Statistics, Missouri University of Science and Technology, Rolla, MO 65409, hex@mst.edu