

Math 4329, Test II

Name _____

1. a. A table of values for $f(x)$ is:

x	$f(x)$
0.0	0.0
0.1	3.0
0.2	0.0

Use quadratic interpolation to estimate $f(0.05)$.

- b. If $f(x) = 3 \sin(5\pi x)$, obtain a reasonable bound on the error in your estimate of $f(0.05)$.

2. Use Taylor series expansions to determine the error in the approximation $u''(t) \approx \frac{u(t) - 2u(t-h) + u(t-2h)}{h^2}$

3. The following function is a cubic spline for what values of a, b, c ?

$$\begin{aligned} s(x) &= 2x^3 - 3x^2 + 3x - 4 & \text{for } 0 < x \leq 1 \\ &= x^3 + ax^2 + bx + c & \text{for } 1 < x \leq 2 \end{aligned}$$

4. Determine values for A, B, C which make

$$\int_0^h f(x)dx \approx Ahf(0) + Bhf(h/3) + Chf(h)$$

as high order as possible. What is the degree of precision and what is the global order?

- 5.
- If a quadrature rule yields errors of 0.0064 when $h = 0.01$ and 0.0002 when $h = 0.0025$, what is the experimental order? ($O(h^?)$)
 - Of all quadrature rules with n sample points per strip, the one with highest degree of precision is called what?
 - Gaussian elimination, when applied to a general N by N linear system, requires approximately how many multiplications?
 - The strategy of switching rows during Gaussian elimination to always bring the largest (in absolute value) potential pivot to the diagonal is called what?
 - True or False: If $f(x)$ is a smooth function and $L_n(x)$ is the Lagrange polynomial that interpolates to f at uniformly spaced points $a = x_0, x_1, \dots, x_n = b$, then for all $a < x < b$, $L_n(x)$ is guaranteed to converge to $f(x)$ as $n \rightarrow \infty$. (Assume no roundoff error.)