Math 4329, Test II

Name _____

1. a. A table of values for $f(x) = sin(\pi x)$ is:

x	$f(x)$
1.0	0.0
1.5	-1.0
2.0	0.0

Use quadratic interpolation to estimate $f(1.6)$.

b. Use the Lagrange error formula to obtain a reasonable bound on the error in your estimate $p_2(1.6)$ of $f(1.6)$.

c. Calculate the exact error $f(1.6) - p_2(1.6)$.

1

2. Use Taylor series expansions to determine the error in the approximation $u'(x) \approx \frac{3u(x)-4u(x-h)+u(x-2h)}{2h}$

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

$$
\begin{aligned}
s(x) &= 2x^3 + 3x^2 + 2x + 5 \quad for \quad 0 < x \le 1 \\
&= x^3 + ax^2 + bx + c \quad\;\; for \quad 1 < x \le 2
\end{aligned}
$$

4. a. Find A, B which make the approximation

$\int_0^h f(x)dx \approx Ahf(0.5h) + Bhf(0.8h)$

as high order as possible.

b. What is the order of the global error, for this A,B?

5. (Note: you must do by hand and show your work.) Find the inverse of

$$A = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix},$$