SP 96
EGN 3420 Exam 3 Name _____

DO ANY 3 PROBLEMS

Show All Work! Use Only Methods Discussed In Class!

Problem 1 (35 pts)

Estimate $\int_0^{\pi/2} \sin x \, dx$

A) Using Trapezoidal Integration with 10 equally spaced intervals.

B) Using Simpsons 1/3 Rule with 10 equally spaced intervals.

Fill in the following table to help with the calculations. Round all calculations and calculator display numbers to 4 places after the decimal. Remember to use radians when evaluating the trigonometric function.

i	x_i	f_i
0	0.0000	0.0000
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

SP 96
EGN 3420 Exam 3 Name _____

Problem 2 (35 pts)

A quadratic spline is to be fit thru the following points: (0,1), (1,2), (3,3), (4,2).

The spline is given by

$$f(x) = \begin{cases} b_1x + c_1 & 0 \le x \le 1 \\ a_2x^2 + b_2x + c_2 & 1 \le x \le 3 \\ a_3x^2 + b_3x + c_3 & 3 \le x \le 4 \end{cases}$$

A system of 8 equations in the 8 unknowns $b_1,c_1,a_2,b_2,c_2,a_3,b_3,c_3$ has been generated, i.e. $A\underline{x} = \underline{b}$. The vectors $\underline{x}$ and $\underline{b}$ are given below. Find the coefficient matrix A.

$$x = \begin{bmatrix} b_1 \\ c_1 \\ a_2 \\ b_2 \\ c_2 \\ a_3 \\ b_3 \\ c_3 \end{bmatrix} \qquad b = \begin{bmatrix} 2 \\ 2 \\ 3 \\ 3 \\ 1 \\ 2 \\ 0 \\ 0 \end{bmatrix}$$

SP 96
EGN 3420 Exam 3 Name _____

Problem 3 (35 pts)

An unknown function generated the following data points:

(0,0), (1,1.6487), (3,13.4451)

A) Find the Newton Divided Difference interpolating polynomial $f_2(x)$.

B) The data points were generated from the function $f(x) = xe^{x/2}$. Find the true error in $f_2(2.5)$.

SP 96
EGN 3420 Exam 3 Name _____

Problem 4 (35 pts)

Test scores of several students in two classes are given below.

Geometry (G)	Chemistry (C)
50	50
68	72
93	100
74	82
86	93
60	67

A) Find the least squares line, $\hat{C}=a_0+a_1G$ for predicting Chemistry scores (C) from Geometry scores (G).

B) Find the coefficient of determination r^2

C) Use the resulting least squares regression line to find the expected score in Chemistry for a student who made 80 on a Geometry test.

G_i	C_i	G_i^2	G_iC_i	$\hat{C}_i$	$(C_i-\hat{C}_i^2)$	$(C_i-\overline{C}_i^2)$
50	50					
68	72					
93	100					
74	82					
86	93					
60	67					