SU 96

EGN 3420 Exam 2 Name ________________

SHOW ALL WORK!

Problem 1 (25 pts)

For the system of equations

$$
\begin{array}{rcrcrcrcrcr}
 & & & & x_3 & + & x_4 & + & x_5 & = & 2 \\
3x_1 & + & 3x_2 & - & 2x_3 & + & x_4 & + & x_5 & = & 2 \\
5x_1 & + & 3x_2 & - & 2x_3 & + & 3x_4 & + & x_5 & = & 4 \\
x_1 & + & 2x_2 & + & x_3 & + & 2x_4 & + & 3x_5 & = & 5
\end{array}
$$

A) Find the Echelon matrix and determine if the equations are consistent.
B) If the equations are consistent, how many arbitrary unknowns are there?
C) Can x_1 and x_2 both be arbitrary? If they can, use the Gauss Jordan method applied to the system of equations with x_1 and x_2 on the right hand side to find x_3, x_4, and x_5 in terms of x_1 and x_2.

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Work Area

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Problem 2 (25 pts)

Find the value(s) of K for which the system of equations below does not possess a unique solution.

$$
\begin{aligned}
w + x + y + z &= 6 \\
w + x + y - z &= 0 \\
2w - x + y &= 1 \\
w - 2x + Ky + 3z &= 7
\end{aligned}
$$

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Work Area

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Problem 3 (25 pts)

Solve the system of equations below using the Gauss-Seidel method. Start with an initial guess of $x^o = 1$, $y^o = 1$, $z^o = 1$. Stop when the magnitude of the true error in z falls below 0.1, i.e. $|3 - z^i| < 0.1$

$$
\begin{aligned}
4x - 2y + z &= 3 \\
x + 3y - z &= 4 \\
x - y + 4z &= 11
\end{aligned}
$$

Keep all intermediate calculations in terms of fractions.

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Problem 4 (25 pts)

Using Simpson's 1/3 Rule to approximate $I = \int_0^1 \frac{1}{1+x} dx$

The interval (0,1) is to be divided into 10 equal subintervals producing a step size of h = 0.1

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Work Area

i	x_i	$f_i = f(x_i)$
0	0.0	1.0000
1	0.1	
2	0.2	
3	0.3	
4	0.4	
5	0.5	
6	0.6	
7	0.7	
8	0.8	
9	0.9	
10	1.0	0.5000