Su 97
EGN 3420 Exam 2 Name_____
SHOW ALL WORK!

Problem 1 (20 pts)

Solve the following system of equations using the Gauss Jordan Elimination Method.

$$\begin{array}{rcrcrcrcr} a & + & b & + & c & + & d & = & 0 \\ 2a & - & b & - & c & + & d & = & 3 \\ a & + & 3b & + & 2c & - & 4d & = & -1 \\ 5a & + & 2b & - & 2c & + & d & = & 7 \end{array}$$

.....

Work Area

$$(A|\underline{b}) = \left[\begin{array}{cccc|c} 1 & 1 & 1 & 1 & 0 \\ 2 & -1 & -1 & 1 & 3 \\ 1 & 3 & 2 & -4 & -1 \\ 5 & 2 & -2 & 1 & 7 \end{array}\right] \approx$$

Su 97
EGN 3420 Exam 2 Name_____
SHOW ALL WORK!

Problem 2 (25 pts)

Consider the following system of equations:

$$\begin{array}{rrrrrrrrrrr} u & + & v & + & w & & & & & = & 2 \\ 2u & - & v & & & - & 3x & - & 3y & = & 1 \\ u & - & 2v & + & 3w & - & 3x & - & 3y & = & -1 \\ u & & & + & w & - & x & - & y & = & 1 \\ 3u & + & v & + & 5w & - & 2x & - & 2y & = & 4 \end{array}$$

A) Show the equations are consistent by transforming the augmented matrix (A|b) into its Echelon Form by performing a sequence of elementary row operations.

B) There are 2 arbitrary unknowns. Explain why.

C) Without solving for a solution determine if x and y are both arbitrary.

D) Repeat Part C) for x and w.

E) What conclusion can be drawn from the results of Part C) and D)?

$$\left[\begin{array}{ccccc|c} 1 & 1 & 1 & 0 & 0 & 2 \\ 2 & -1 & 0 & -3 & -3 & 1 \\ 1 & -2 & 3 & -3 & -3 & -1 \\ 1 & 0 & 1 & -1 & -1 & 1 \\ 3 & 1 & 5 & -2 & -2 & 4 \end{array}\right]$$

Augmented Matrix

Su 97
EGN 3420 Exam 2 Name_____
SHOW ALL WORK!

Problem 3 (25 pts)

Find the value(s) of K in the system of equations below which result in an infinite number of solutions. Use only methods discussed in class.

$$
\begin{array}{rcrcrcr}
x_1 & + & 4x_2 & + & 7x_3 & = & -5 \\
x_1 & + & x_2 & + & x_3 & = & 1 \\
2x_1 & + & 3x_2 & + & 4x_3 & = & 0 \\
x_1 & - & x_2 & + & Kx_3 & = & 0
\end{array}
$$

Su 97
EGN 3420 Exam 2 Name_____
SHOW ALL WORK!

Problem 4 (30 pts)

Consider the system of equations $A\underline{x}=b$ below.

1. Find the inverse of A and the solution $\underline{x}=A^{-1}\underline{b}$.
2. Perform two iterations of the Gauss-Seidel method and compute the true errors in x, y and z, i.e. $(E_T)_x$, $(E_T)_y$ and $(E_T)_z$ at the end of the second iteration. Start with an initial guess of $x_0 = y_0 = z_0 = 1$.

$$\begin{array}{rcrcrcr} 5x & + & y & + & z & = & 45 \\ x & + & 5y & + & z & = & 25 \\ -x & + & y & + & 5z & = & -55 \end{array}$$