Math 202 Problem Set on Chapter 1 F07 C.S.Davis

Name ________________________________

1. Consider this system of linear equations.

a. Solve the system graphically. Label the axes with numbers. Estimate the solution.

$5x + 4y = 20$
$2x - 5y = 20$

```
                y
                +
                +
                +
                +
                +
+ + + + + + + + + + + x
                +
                +
                +
                +
                +
                +
```

b. Convert the system to a matrix equation.

c. Convert the system to a linear combination of column vectors.

d. Use Gaussian elimination and back substitution to find the solution exactly. use the equations and show the operations.

2. Given this linear equation, $3x - 2y = 7$, write a second equation so that the system of the two equations

   a. will have a unique solution.

   b. will have no solution.

   c. will have an infinite number of solutions.

   d. In case c, find the solution and write it parametrically using the parameter t.

3. Given the augmented matrix for a system of equations, perform another row operation (or two) to obtain row reduced echelon form (rref). Then write the solution, if any, parametrically using any of r, s and t as parameters.

   a.
$$\begin{array}{c} \begin{array}{ccccc} x & y & z & w & \end{array} \\ \begin{bmatrix} 1 & 4 & 3 & 1 & -2 \\ 0 & 1 & 2 & -1 & 3 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

   b.
$$\begin{array}{c} \begin{array}{cccccc} x & y & z & u & v & \end{array} \\ \begin{bmatrix} 1 & 3 & 5 & 0 & 8 & 20 \\ 0 & 0 & 0 & 3 & 6 & 30 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

4. By hand, find the solution of the system below by the Gauss-Jordan method. Specify the row operation you are using on the augmented matrix at each step. Check your solution by substituting it into each of the original equations. Do a helpful swap as your first step.

$$\begin{aligned} 4y + 3z &= 5 \\ -3x + 2y - 3z &= -5 \\ x + 3z &= 1 \end{aligned}$$

Solution: ____________________________

Check:

5. a. Use the rref function on the TI to solve this homogeneous system. Write the solution using the parameter t.

$$\begin{aligned} x + y + z &= 0 \\ 2x + y + 3z &= 0 \\ 7x + 5y + 9z &= 0 \end{aligned}$$

b Use the rref function this nonhomogeneous system.

$$\begin{aligned} x + y + z &= 10 \\ 2x + y + 3z &= 7 \\ 7x + 5y + 9z &= 44 \end{aligned}$$

c. Compare the two solutions and make a conjecture.

6. The U.S. population for the years 1970, 1980, 1990, 2000 is approximately given in the table below.

Year	1970	1980	1990	2000
Population (in millions)	200	225	255	295

a. Find a cubic polynomial which fits this data. Use x=0 for the year 1970 to simplify the problem. Use the graphing calculator to you best advantage to solve the system and find the coefficients of the cubic polynomial.

b. Use the cubic polynomial to estimate the population in the year 2010.

For the last two problems found in our text, Larson, Edwards and Falvo (6^{th} edition), use the calculator to you best advantage to find the solutions and answer the questions.

7. Section 1.3 #24 about traffic flow.

8. Section 1.3 #26 about an electric network.