Math 1310 Assignment 1

[5] 1. The Silver-Eyes baseball team sells adult tickets for \$15 each and children's tickets for \$10 each. At a recent performance 10,000 tickets were sold and the total revenue was \$137,500. How many tickets of each type of were sold?

[10] 2. A theatre has 500 seats, divided into orchestra, main and balcony seating. Orchestra seats sell for \$50, main seats for \$35 and balcony seats for \$25. If all the seats are sold the revenue to the theatre is \$17,100. If all the main and balcony seats are sold, but only half the orchestra seats are sold, the revenue is \$14,600. How many are there of each kind of seat?

[10] 3. A candy manufacturing company has daily fixed costs from salaries and building operations of \$300. Each pound of candy produced costs \$1.00 and is sold for \$2.00.
(a) Find the cost C of producing x pounds of candy.
(b) Find the revenue R obtained from selling x pounds of candy.
(c) What is the break-even point? That is, how many pounds of candy must be sold daily to guarantee no loss or profit?
(d) Graph C and R and label the break-even point.

[10] 4. Let l be the line having the equation $4x + 5y = 20$.
(a) Sketch the graph of the line l.
(b) Find an equation for the line l_1 that passes through the point (2,3) and is perpendicular to the given line l.
(c) Find an equation of the line l_2 that passes through the point (1,3) and is parallel to the given line l.
(d) Find the coordinates of the point of intersection of the lines l_1 and l_2.

[5] 5a. Find all 2 by 3 row reduced echelon form (RREF) matrices.

[5] 5b. Find all 1 by 3 row reduced echelon form (RREF) matrices.

[10] 6. Determine which of the following matrices are in RREF. For the matrices that are not in RREF form, perform the necessary row operations to reduce them to RREF.

$$M = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix},\ N = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 3 & 0 \end{bmatrix},\ P = \begin{bmatrix} 1 & 0 & 3 & 0 \\ 0 & 1 & 2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix},\ Q = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 3 & -1 \\ 0 & 1 & 0 \end{bmatrix},\ S = \begin{bmatrix} 0 & 1 & 2 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

[5] 7. Use the Gaussian elimination method with back substitution to solve the following system of linear equations.

$$x+2y+z=6$$
$$2x-y+z=4$$
$$3x+y-z=1$$

[5] 8. Use the Gauss-Jordan elimination procedure to solve the following system.

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

[5] 9. Find values for *a* and *b* so that the following system of equations will have a solution where *x* and *y* have the same value.

$$2x + 5y = 6$$
$$ax + by = 0$$

[10] 10. Consider the system of linear equations

$$x+3y=5$$
$$2x+ay=b$$

where *a* and *b* are real numbers.

(a) Write out the augmented matrix for this system of linear equations

(b) Use elementary row operations to reduce the augmented matrix to row-echelon form.

(c) Determine for what values of *a* and *b* does the system have infinitely many solutions.

(d) Determine for what values of *a* and *b* does the system have no solution.

(e) Determine for what values of *a* and *b* does the system have an unique solution.

Total value of all questions is 80 marks.