MATH 1310 Matrices for Management and Social Sciences

Assignment 1

[10] 1. Anne goes to the supermarket and purchases 1 pound of apples and 2 pounds of bananas for which she pays $2.37. Later that day Betty goes to the same supermarket and purchases 1 pound of bananas and 2 pounds of grapes for which she pays $4.57. Still later that day Carol goes to the same supermarket and purchases 2 pounds of apples, 3 pounds of bananas and 1 pound of grapes for which she pays $6.14. Assuming there was no change of price for the fruit during that day; find the price per pound for the apples, the bananas and the grapes.

[10] 2. Diane's change purse contains both dimes and quarters in it. If the total value of the dimes and quarters is $2.00 and there are more quarters than dimes, how many dimes and how many quarters are in the change purse?

[10] 3. Tammy sells hand-crafted bead necklaces at craft fair. The rental cost for a booth is $50 and her cost of material to produce one necklace is $2.50. She sells the necklaces for $5.00 each.

(a) Find the linear cost function for Tammy to set up and sell x necklaces at the craft fair.

(b) Find the revenue function for the sale of x necklaces.

(c) How many necklaces must Tammy produce and sell to break even?

(d) How many necklaces must she produce and sell to make a profit of $75.00?

(e) Draw the graphs of the cost function C and the revenue function R on the same diagram and label the break-even point on the diagram.

[10] 4. Let l be the line having the equation $3x + 4y = 12$.

(a) Sketch the graph of the line l.

(b) Find an equation for the line l_1 that passes through the point (2,5) 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.

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

[10] 6. Determine which of the following matrices are in RREF. If a matrix is not in RREF, reduce it to RREF.

$$A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 2 \\ 0 & 0 & 1 \end{bmatrix} \quad D = \begin{bmatrix} 0 & 1 & 2 \\ 0 & 0 & 1 \\ 2 & 0 & 1 \end{bmatrix} \quad E = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

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

$$\begin{aligned} x + y + z + w &= 5 \\ 2x + 3y + 2z + 3w &= 7 \\ 3x + 4y + 3z + 5w &= 10 \end{aligned}$$

[10] 8. Use the Gauss-Jordan elimination method to solve the following system of linear equations.

$$\begin{aligned} x + y + 2z &= 5 \\ x + 3y + z &= 6 \\ 3x + 2y - z &= 2 \end{aligned}$$

[10] 9. Provide examples to illustrate the following.

(a) A system of 3 linear equations involving 2 variables that has infinitely many solutions.

(b) A system of 2 linear equations involving 3 variables that has no solutions.

(c) A system of 2 linear equations involving 2 variables whose only solution is both variables equal 0.

[10] 10. Find the value(s) of k for which the following system of homogeneous linear equations has only the trivial solution $x = y = z = 0$.

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