MATH 120 **Section 4.1 Systems of Linear Equations in Two Variables**

A <u>system of linear equations</u> consists of two or more linear equations, which are solved simultaneously.
A <u>solution</u> to a system consists of the values of the variables which make the system true.

Three Methods for Solving Systems

I. Graphing
II. Substitution
Solve one equation for a variable and substitute into the other equation.
III. Elimination (Sometimes called Addition)

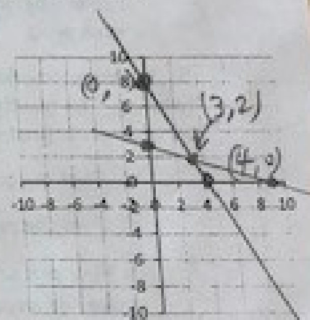
- Multiply one or both equations by a value or values, so that the coefficients of one variable in both equations are the same number but opposite signs.
- Add the equations so that one variable is eliminated.

Problems

1. Solve the system of linear equations by the following methods:
a) Graphing, b) Elimination, c) Substitution.

$$\begin{cases} 2x + y = 8 & (0,8)\ (4,0) \\ x + 3y = 9 & (0,3)\ (9,0) \end{cases}$$

Solution is (3,2)



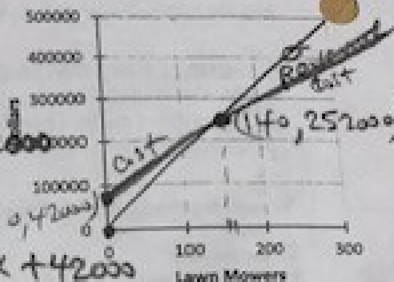
2. Animals in an experiment are to be kept under a strict diet. Each animal should receive 60 grams of protein and 10 grams of fat. The laboratory technician is able to purchase two food mixes: Mix A has 20% protein and 6% fat. Mix B has 50% protein and 5% fat. Complete the chart. Write and solve a system of equations to determine how many grams of each mix should be used to obtain the right diet for one animal?

	Grams of Mix A (x)	Grams of Mix B (y)	Total
Protein	0.20	0.50	60
Fat	0.06	0.05	10

$$A = \begin{bmatrix} 0.20 & 0.50 & 60 \\ 0.06 & 0.05 & 10 \end{bmatrix} \quad rref[A] = \begin{bmatrix} 1 & 0 & 100 \\ 0 & 1 & 80 \end{bmatrix}$$

In Conclusion they should use 100 grams of Mix A and 80 grams of Mix B.

4. A company produces lawn mowers. The company's daily fixed costs are $42,000 and variable costs are $1500 per lawn mower. The mowers are sold for $1800 each.



a) Find the cost function $C(x)$. $= 1500X + 42000$

b) Find the revenue function $R(x) = 1800X$

c) Find the break-even point. Write your answer as an ordered pair. $1800X = 1500X + 42000$

$-1500X \quad -1500X$

$300X = 42000$

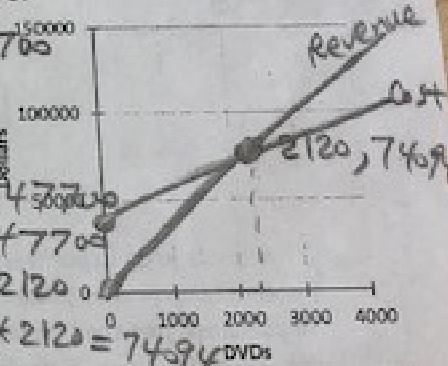
$X = \frac{42000}{300} = 140$

$1800 * 140 = 252000$

d) Graph the cost and revenue functions on the given coordinate system and show the break-even point.

e) Write the meaning of the break-even point you found in part c using complete sentences with correct units. Include an interpretation of the regions between the lines that are to the left and to the right of the break-even point. If they sell more than 140 lawn mowers, they will make profit

5. A company markets exercise DVDs that sell for $34.95 including shipping and handling. The monthly fixed costs (advertising, rent, etc.) are $47,700 and the variable costs (materials, shipping, etc.) are $12.45 per DVD.



a) Find the cost function $C(x) = 12.45X + 47700$

b) Find the revenue function $R(x) = 34.95X$

c) Find the break-even point. Write your answer as an ordered pair. $34.95X = 12.45X + 47700$

$22.5X = 47700$

$X = 2120$

$34.95 * 2120 = 74094$

d) Graph the cost and revenue functions on the given coordinate system and show the break-even point.

e) Write the meaning of the break-even point you found in part c using complete sentences with correct units. Include an interpretation of the regions between the lines that are to the left and to the right of the break-even point.

If they sell more than 2120 DVDS, they will make a profit