7.1 Notes: Linear and Nonlinear Systems of Equations

Ex: 1 Solve the system of equations by **substitution.**

$$x - y = 3$$
$$3x - 4y = 7$$

Ex: 2 Solve the system of equations by **substitution.**

$$3x^2 - 2x + y = 0$$
$$-x + y = -2$$

Ex: 3 Solve the system of equations by **substitution.**

$$3x - y = -1$$
$$5x^2 + y = 0$$

Ex: 4 Solve the system of equations by **substitution.**

$$\begin{cases} y = 4x - 4 \\ 8x - 2y = 8 \end{cases}$$

Solve each of the following system of equations by **elimination.**

Ex: 5 $\begin{cases} 3x + 2y = 4 \\ 5x - 2y = 12 \end{cases}$

Ex: 6 $\begin{cases} 2x + y = 1 \\ 6x - 3y = 6 \end{cases}$

Ex: 7 $\begin{cases} 3x + 2y = 7 \\ 2x + 5y = 1 \end{cases}$

Ex: 8

$$\begin{cases} x + 2y = 4 \\ 3x + 6y = 13 \end{cases}$$

Ex: 9 The weekly ticket sales for a new animated movie decreased each week. At the same time, the weekly ticket sales for a new horror movie increased each week. Models that approximate the weekly ticket sales S (in millions of dollars) for the movies are

$$S = 108 - 9.4x$$
$$S = 16 + 9x$$

where x represents the number of weeks each movie was in theaters, with $x = 0$ corresponding to the opening weekend. After how many weeks will the ticket sales for the two movies be equal?

Ex: 10 Finding a Break-Even Point

A company that manufactures running shoes has a fixed cost of $300,000. Additionally, it costs $30 to produce each pair of shoes. They are sold at $80 per pair.

a. Write the cost function, C, of producing x pairs of running shoes.

b. Write the revenue function, R, from the sale of x pairs of running shoes.

c. Determine the break-even point. Describe what this means.

Determining the Equilibrium Price

Supply Curve: As one variable increases, the other also increases. (Suppliers will increase production if they can get higher prices for their product)

Demand Curve: As one variable increases, the other decreases. (Demand for a product by consumers will decrease as the price goes up)

A point where the supply and demand curve intersect is an equilibrium point. The corresponding price is the equilibrium price.

Ex: 11

Nibok Manufacturing has determined that production and price of a new tennis shoe should be geared to the equilibrium point for this system of equations.

$p = 160 - 5x$

$p = 35 + 20x$

The price, p, is in dollars and the number of shoes, x, is in millions of pairs. Find the equilibrium point.