4.1 - Review: Systems of Linear Equations in Two Variables

Read pages 176 – 18

Homework: 1 – 29 (odd), 35, 37, 39, 53, 55

How to solve a system of linear equations of the form \( ax + by = h \)
\( cx + dy = k \)

1. Graphically (by hand or with a graphing utility)
2. Algebraically
   - Use substitution
   - Use elimination by addition
3. Use Matrices (Section 4.2)

Classifications of systems of linear equations:

A. If the system has one or more solutions, we say it is consistent.
   - If there is exactly one solution, the system is independent
   - If there are infinitely many solutions, the system is dependent
   In this case let \( x = k \) to get the solution \( y = f (k) \) (\( k \) is called a parameter).
   Replacing \( k \) with a real number produces a particular solution of the form \( (k, f (k)) \).
B. If the system has no solutions we say it is inconsistent.

Q1: Solve the system of linear equations

\[
\begin{align*}
  x - 2y &= -8 \\
  2x + y &= 9
\end{align*}
\]

A. Graphically

B. Using substitution
   1. Using one equation, solve for one variable.
   2. Substitute for solved variable in 2nd equation.

Classify ______________________________
C. Using elimination by addition.
A system of linear equations is transformed into an equivalent system if
- Two equations are interchanged
- An equation is multiplied by a non-zero constant
- A constant multiple of one equation is added to another equation

\[ x - 2y = -8 \]
\[ 2x + y = 9 \]

Q2: Solve the system
\[ -6x + 3y = 9 \]
\[ 4x - 2y = 8 \]

Classify: ________________________________

Q3: Solve the system
\[ -6x + 3y = 9 \]
\[ 4x - 2y = -6 \]

Classify: ________________________________

Express the infinite number of solutions in terms of the parameter \( k \).
Q4: Suppose that the supply and demand equations for printed baseball caps in a resort town are

\[
\text{price – supply: } \ p = 0.4q + 3.2 \quad \text{price – demand: } \ p = -1.9q + 17
\]

where \( q \) is the quantity of caps (in hundreds) and \( p \) is the price of one hat in dollars.

A. Discuss the stability of the baseball cap market at $4.

B. Find the equilibrium price and quantity.

Q5: A small company manufactures portable home computers. The plant has fixed costs (leases, insurance, utilities, etc.) of $65,000 per month and variable costs (labor, materials etc.) of $1,100 per unit produced. The computers are sold for $1600 each.

Let \( x \) = the number of units produced and sold
\( y \) = the monetary amount in $

A. What is the cost equation?

B. What is the revenue equation?

C. Graph both equations in the same coordinate system and
   - show and find the break – even point.
   - Interpret the regions between the lines and to the left and to the right of the break – even point.