4.2 The Substitution Method

Process - Substitution Method

1. Solve one of the equations for either x or y.
2. Substitute this new equation into the other equation.
3. Solve this new one-variable equation.
4. Plug this value into either of the original equations to find the missing value.
5. Write the solution as a point.

Example 4.2.1
Solve the following with the substitution method:

$$\begin{cases} -5x + y = -13 \\ 2x + 3y = 12 \end{cases}$$

Example 4.2.2
Solve the following with the substitution method:

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

Example 4.2.3
Solve the following with the substitution method:

$$\begin{cases} 3x + y = -5 \\ y = -3x + 3 \end{cases}$$

Example 4.2.4
Solve the following with the substitution method:

$$\begin{cases} -3x + y = -4 \\ 9x - 3y = 12 \end{cases}$$

Example 4.2.5
The Supply & Demand of Pizza

Price/Slice	Demand (Qty)	Supply (Qty)	Result
\$0.50	300	100	shortage - more is needed than supplied
\$1.00	250	150	
\$2.00	150	250	surplus - more is supplied than needed; there is waste
\$3.00	50	350	

We want to find the *equilibrium price and quantity* – that is, the price and quantity that leaves no shortage and no surplus. We can also think of it as the *point* at which supply and demand meet.

Two equations have been constructed to model this situation. The equation $p = -0.01x + 3.5$ gives us the price (p) of a single slice of pizza when the demand is x slices. The equation $p = 0.01x - 0.5$ gives us the price of a single slice when their are x slices supplied.

How much do we charge per slice and how many slices do we make in order to have no shortage and no surplus?