Linear Equations & Straight Lines

The Intersection Point Of a Pair of Lines

Methods for Solving Systems of Equations

• By Graphing
• By Substitution
• By Elimination

• When you solve a system of linear equations, you are looking for a point of intersection – if it exists.

Example

• Solve the system

\[
\begin{align*}
2x + 3y &= 13 \\
5x - 2y &= 4.
\end{align*}
\]

Example

• Solve the system

\[
\begin{align*}
2x + 3y &= 7 \\
4x - 2y &= 9.
\end{align*}
\]

Point of Intersection Graph

Point of Intersection: \((41/16, 5/8)\)

\[
y = 2x - 9/2 \\
(41/16, 5/8) \\
y = (-2/3)x + 7/3
\]

Example

• Find the point of intersection of the lines \(y = 2x - 1\) and \(x = 2\).
For every quantity $q$ of a commodity, the supply curve specifies the price $p$ that must be charged for a manufacturer to be willing to produce $q$ units of the commodity.

For every quantity $q$ of a commodity, the demand curve gives the price $p$ that must be charged in order for $q$ units of the commodity to be sold.

The equilibrium price of a commodity is the price found at the point where the supply and demand graphs for that commodity intersect.

The equilibrium quantity is the demand and supply at that same point.

Example:

• Suppose the supply and demand for a quantity is given by $p = 0.0002q + 2$ (in dollars) and $p = -0.0005q + 5.5$.

Determine both the quantity of the commodity that will be produced and the price at which it will sell when supply equals demand.

Example

• The demand curve for a certain commodity is $p = -0.001q + 32.5$.

a.) At what price can 31,500 units of the commodity be sold?

b.) What quantities are so large that that many units of the commodity cannot possibly all be sold no matter how low the price?
Example

- A plant supervisor must apportion her 40-hour workweek between hours working on the assembly line and hours supervising the work of others. She is paid $12 per hour for working and $15 per hour for supervising. If her earnings for a certain week are $504, how much time does she spend on each task?