In section 7.5 you will learn to:

- Sketch the graphs of inequalities in two variables.
- Solve systems of linear inequalities in two variables.
- Model and solve real-life problems with systems of inequalities in two variables.

**Example 1**

Graph solutions to: $y < x^2 + 3$

Any curve cuts the plane into two parts. An inequality in 2 variables means we want to shade all points that are solutions of the inequality.
If you have two or more inequalities that you wish to solve simultaneously, you need to:

1. Graph both graphs (curves) on same plane
2. Shade in region that satisfies all inequalities
3. Label vertices (pts of intersection)

Of interest are the vertices (where two equations meet) and the common shaded region.

Example 2
Solve and label vertices for:

\[ 4x - 6y > -12 \]
\[ x - y > 1 \]
\[ y = 0 \]

\[ \begin{align*}
\text{A:} & & \text{B:} \\
\text{test pt:} & (0, 1) & \text{test pt:} & (0, 1) \\
\text{A:} & & \text{B:} \\
\text{B:} & & \text{B:} \\
\end{align*} \]

Example 3
Solve and label vertices

\[ y \leq 2x - x^2 \]
\[ 0 \leq x + y \]

\[ \begin{align*}
\text{A:} & & \text{B:} \\
\text{test pt:} & (1, 0) & \text{test pt:} & (1, 0) \\
\text{A:} & & \text{B:} \\
\text{B:} & & \text{B:} \\
\end{align*} \]
Example 4

For a concert event, there are $30 reserved seat tickets, and $20 general admission tickets. There are 2000 reserved sets available and the fire regulations limit the number of paid ticket holders to 3000. The promoter must take in $75,000 in ticket sales. Find and graph the system of inequalities describing the different number of tickets that can be sold.

\[ x = \# \text{ $30 \text{ tix}} \]
\[ y = \# \text{ $20 \text{ tix}} \]

1. \[ x \leq 2000 \]
2. \[ x + y \leq 3000 \]
3. \[ 30x + 20y \geq 75000 \]
   \[ \text{total revenue (\$)} \]
4. \[ x \geq 0, y \geq 0 \]