Chapter 7 Systems of Equations and Inequalities

Section 7.5 Systems of Inequalities

Course/Section
Lesson Number
Date

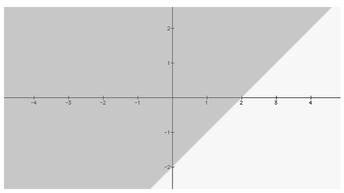
Section Objectives: Students will know how to sketch the graphs of inequalities in two variables and how to solve systems of inequalities.

I. The Graph of an Inequality (pp. 541−542) Pace: 5 minutes

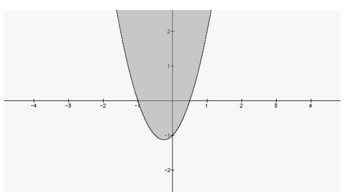
- State that to sketch the graph of an inequality in two variables, we:
  1. Replace the inequality symbol with an equal sign and sketch the graph of the resulting equation. (Use a dashed line for < or > and a solid line for ≤ or ≥.)
  2. Test a point in one of the regions of the original inequality. If it is a solution, shade that region. If it is not a solution, shade the other region.

Example 1. Sketch the graphs of the following inequalities.

a) $x - y < 2$



b) $y \geq 2x^2 + x - 1$



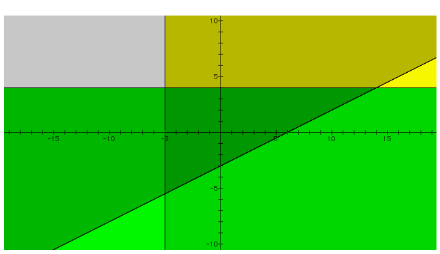
- Discuss the *Technology* on page 542 of the text.

II. Systems of Inequalities (pp. 543−545) Pace: 15 minutes

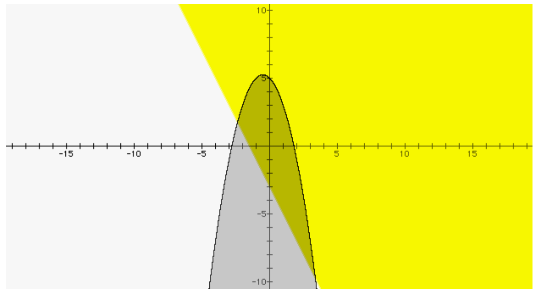
- State that to graph a system of inequalities, we graph each inequality in the system. The **solution** of the system is the region where all the shaded regions overlap. The points at which boundary lines intersect are called the **vertices** of the solution region.

Example 2. Graph the following systems of inequalities.

a) $\begin{cases} x - 2y \leq 6 \\ x \geq -5 \\ y \leq 4 \end{cases}$



b) $\begin{cases} y \le 5 - x - x^2 \\ y > -2x - 3 \end{cases}$



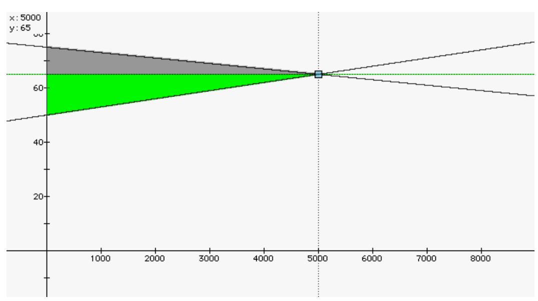
III. Applications (pp. 546−547) Pace: 10 minutes

- Define the **consumer surplus** to be the area of the region bounded by the demand curve, the horizontal line through the point of equilibrium, and the line $x = 0$. The **producer surplus** is the area of the region bounded by the supply curve, the horizontal line through the point of equilibrium, and the line $x = 0$.

Example 3. The demand function for a certain product is $p = 75 - 0.002x$, and the supply function for the same product is $p = 50 + 0.003x$, where p is the price in dollars and x is the number of units. Graph both the consumer and producer surpluses.
Solving these two equations simultaneously, we get the point of equilibrium at (5000, 65).

The consumer surplus is $\begin{cases} p \le 75 - 0.002x \\ p \ge 65 \\ x \ge 0 \end{cases}$

The producer surplus is $\begin{cases} p \ge 50 + 0.003x \\ p \le 65 \\ x \ge 0 \end{cases}$



•Assign the *Writing About Mathematics* on page 547 of the text.