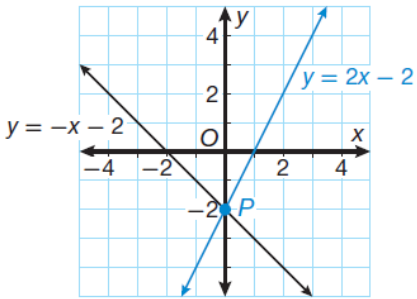# Geometry Lesson 81

Objective: TSW graph and solve linear systems.

A system of equations is a set of two or more equations that have two or more variables. A system of linear equations can be solved algebraically or by graphing the lines.

If the lines are graphed, the solution to the system is the coordinates of the point where the lines intersect. In this example, the solution to the system is point P. To solve a system algebraically, solve both equations for the same variable and use substitution.

Example 1 Solving Linear Systems Algebraically

Solve this system of equations algebraically.

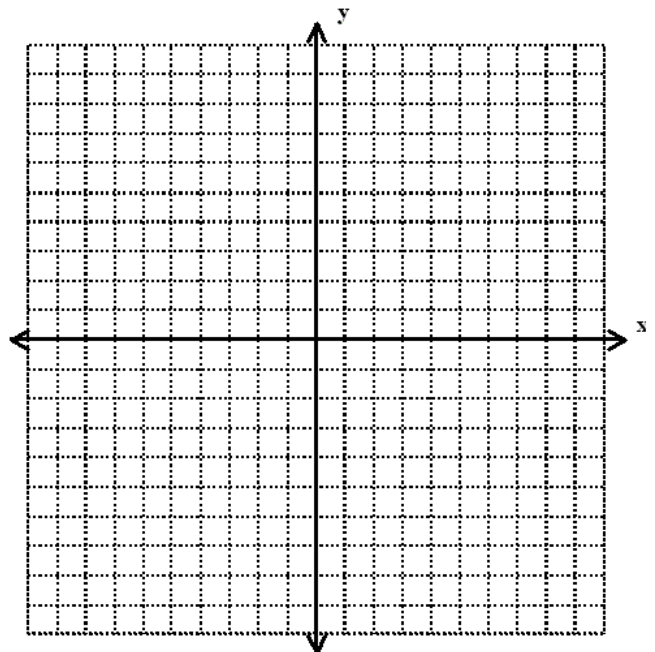$$y = \frac{1}{2}x - 1 \qquad\qquad y = -\frac{3}{2}x + 3$$

Example 2 Solving Linear Systems Graphically

Estimate the solution to this linear system by graphing the lines.

$$y = -\frac{1}{2}x - 3$$
$$y = \frac{3}{2}x + 1$$

SOLUTION

If two lines are parallel, they do not intersect. A system of equations that represents two or more parallel lines has no solution.

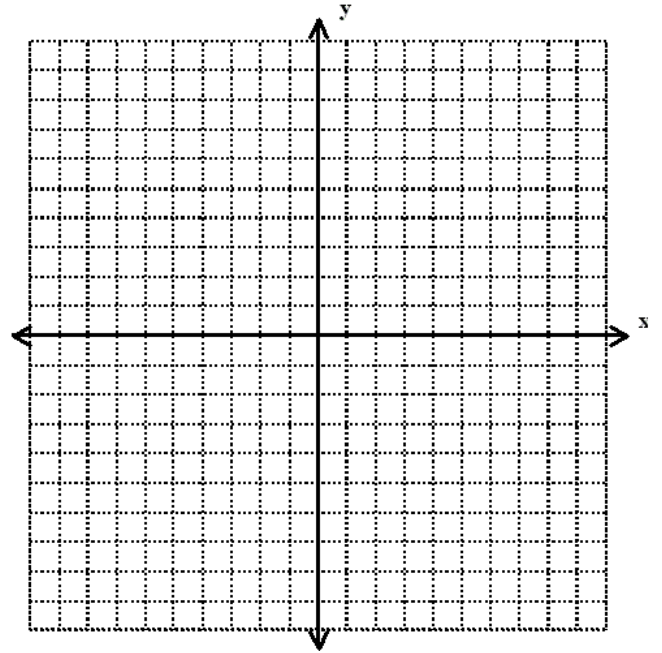Example 3 Analyzing Unsolvable Systems

Graph this linear system to determine if there is a solution.

$$y = 2x - 1$$
$$y = \frac{4}{2}x + 2$$
$$2y - 2 = 4x - 2$$

SOLUTION

Note that solving a system of equations graphically is not as accurate as solving the same system algebraically.

Example 4 Application: Economics

An economist is trying to determine the optimum price for a new product. He knows the supply of the product is represented by the function $y = \frac{2}{3}x + 50$ and the demand curve for the product is represented by the function $y = -\frac{1}{3}x + 200$, where y is the price of the product and x is the number of units sold. What is the optimum price of the product? How many units will sell at this price?

SOLUTION

Math Reasoning

Estimate In Example 3, suppose the third line had slope 2.1. Would this line intersect each of the other two lines? If yes, in which quadrant would the lines intersect?

You Try!!!!

a. Solve the system of equations algebraically.

$$y = \frac{2}{3}x - 8 \qquad\qquad\qquad y = \frac{1}{4}x + 2$$

b. Solve the system of equations algebraically.

$$y = -\frac{2}{3}x - 3 \qquad\qquad\qquad y = \frac{1}{2}x + 2$$

c. Solve the system of equations by graphing.

$$y = 3x + 4 \qquad\qquad\qquad y = -x + 8$$

d. Determine if there is a solution for this system. If not, explain why.

e. The supply curve for a product is represented by $y = 2x + 20$ and the demand curve for the product is represented by $y = -\frac{1}{2}x + 80$ where y is the price of the product, and x is the number of units sold. What is the optimum price of the product and how many units will be sold at this price?

$$y = -2x - 3$$

$$y = -2x + 1$$