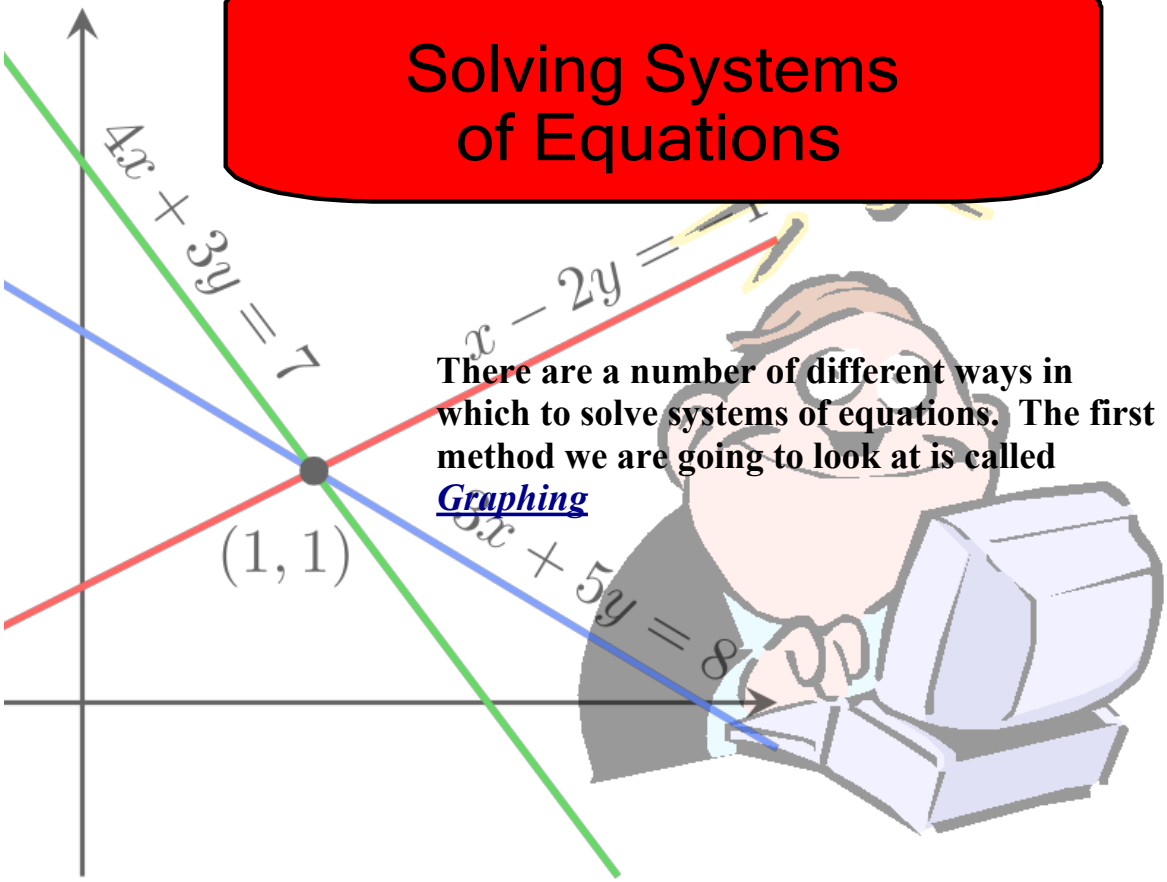
Solving Systems of Equations



There are a number of different ways in which to solve systems of equations. The first method we are going to look at is called *Graphing*

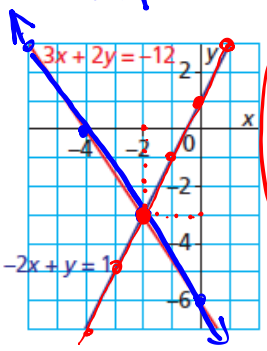
The solution of a linear system can be estimated by graphing both equations on the same grid. If the two lines intersect, the coordinates (x, y) of the point of intersection are the solution of the linear system.

Ex

$3x + 2y = -12$ ①

$-2x + y = 1$ ②

rise / run $\quad \frac{-3}{2} \quad -\frac{3}{2}$ up 3, left 2



Solution $(-2, -3)$

① $3x + 2y = -12$ (−3x, −3x)

$2y = -3x - 12$

$\frac{2y}{2} = \frac{-3x}{2} - \frac{12}{2}$

$y = -\frac{3}{2}x - 6$

② $-2x + y = 1$ (+2x, +2x)

$y = 2x + 1$

up 2, right 1 $\quad$ down 2, left 1

We can use the graphs to estimate the solution of the linear system.
The set of points that satisfy equation ① lie on its graph.
The set of points that satisfy equation ② lie on its graph.
The set of points that satisfy both equations lie where the two graphs intersect.
From the graphs, the point of intersection appears to be $(-2, -3)$.

Example 1 Solving a Linear System by Graphing

Solve this linear system.

$x + y = 8$ ①

$3x - 2y = 14$ ②

① $y = -x + 8$ (−3x)

② $3x - 2y = 14$ (−3x)

$-2y = -3x + 14$

$\frac{-2y}{-2} = \frac{-3x}{-2} + \frac{14}{-2}$

$y = \frac{3}{2}x - 7$

SOLUTION

$x + y = 8$ ①

$3x - 2y = 14$ ②

Determine the x-intercept and y-intercept of the graph of equation ①.
Both the x- and y-intercepts are 8.

Write equation ② in slope-intercept form.

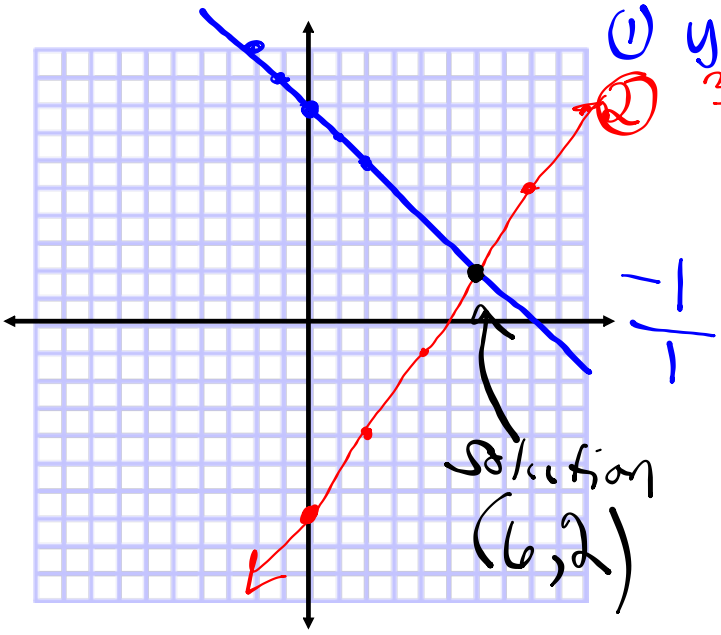
$3x - 2y = 14$

$-2y = -3x + 14$ Divide by -2 to solve for y.

$y = \frac{3}{2}x - 7$

The slope of the graph of equation ② is $\frac{3}{2}$, and its y-intercept is -7.

(Solution continues.)



① $y = -x + 8$ $-3x$

$3x + 2y = 14$

$\frac{2y}{2} = \frac{-3x}{-2} + \frac{14}{-2}$

$y = \frac{3}{2}x - 7$

-1

1

up 3

right 2

down 3

left 2

Solve this linear system.

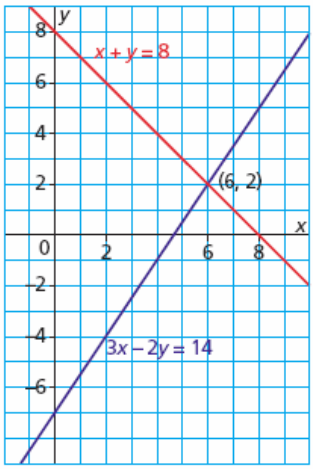
① $x + y = 8$

② $3x - 2y = 14$

Example 1 Solving a Linear System by Graphing

Graph each line.

The point of intersection appears to be (6, 2).



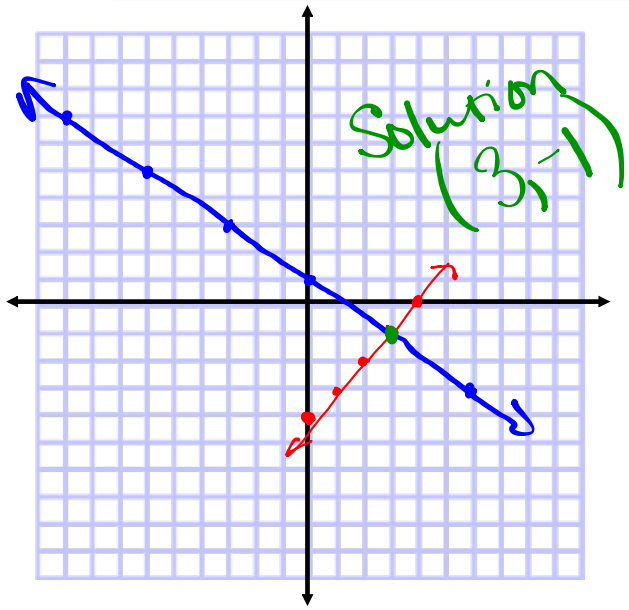
(Solution continues.)

CHECK YOUR UNDERSTANDING

1. Solve this linear system.

$2x + 3y = 3$ ①

$x - y = 4$ ②



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

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

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

$y = x - 4$

Solving Sys of Equations by Graph

ALL (both sides)

Solving by Graphing

5, 6, 7, 8 (back side)

$x = -1$ undefined slope, vertical

$y = -1$ slope 0, horizontal