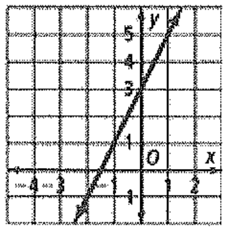
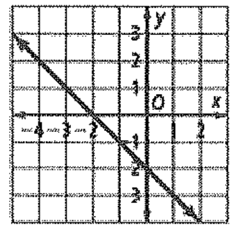
43. 	44. 

The slopes of parallel and perpendicular lines have special relationships. Parallel lines have the **same slope**. Lines that are perpendicular have slopes that are **negative reciprocals** of each other.

Write an equation of each line in slope-intercept form.

45. through $(-2, -2)$ and parallel to $y = -5x - 4$	46. through $(-4, 1)$ and perpendicular to $y = -3x + 7$

Graphing Linear Equations

VOCABULARY

The **slope-intercept form** of a linear equation is $y = mx + b$, where m is the slope and b is the y-intercept.

The **standard form** of a linear equation is $Ax + By = C$, where A and B are not both zero.

The **y-intercept** is the point where the line crosses the y-axis and is found by letting $x = 0$ and solving for y.

The **x-intercept** is the point where the line crosses the x-axis and is found by letting $y = 0$ and solving for x.

EXAMPLE 1 *Graphing with the Slope-Intercept Form*

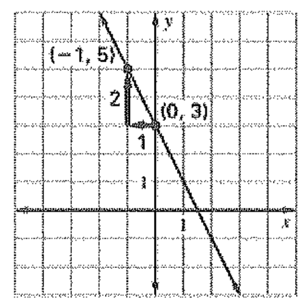
Graph $2x + y = 3$.

SOLUTION

1. Write the equation in slope-intercept form by subtracting $2x$ from each side.

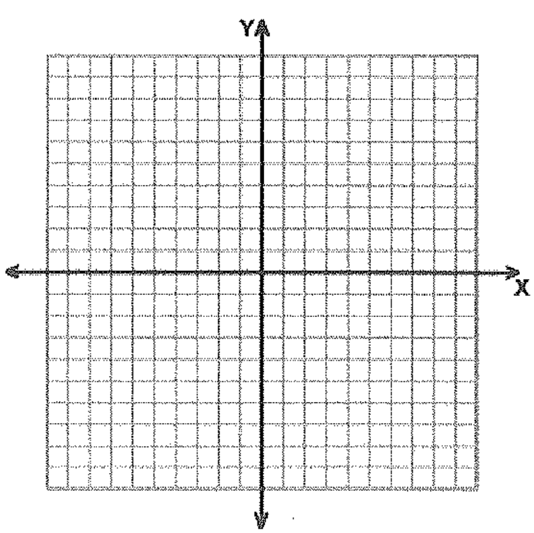
   $y = -2x + 3$

2. The y-intercept is 3, so plot the point $(0, 3)$.
3. The slope is $-\frac{2}{1}$, so plot a second point by moving 1 unit to the left and 2 units up. This point is $(-1, 5)$.
4. Draw a line through the two points.

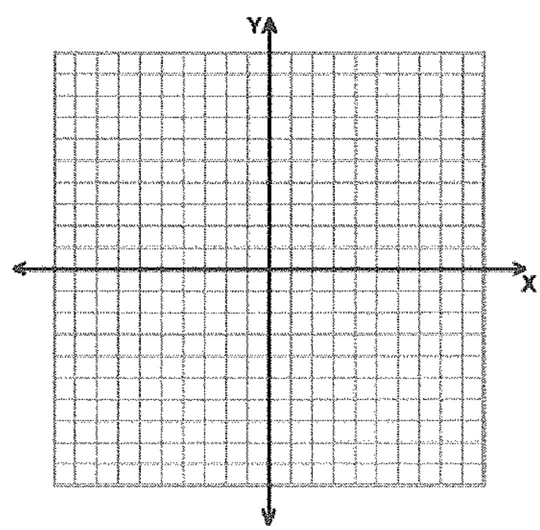


Graph the equation.

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



48. $-3x - y = 4$



EXAMPLE 2 Graphing with the Standard Form

Graph $-2x + 3y = -6$.

SOLUTION

1. The equation is already in standard form.
2. $-2x + 3(0) = -6$ Let $y = 0$.

   $x = 3$ Solve for x.

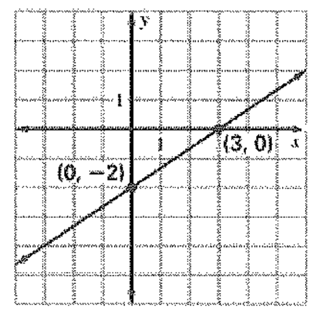
   Plot $(3, 0)$, the x-intercept.

3. $-2(0) + 3y = -6$ Let $x = 0$.

   $y = -2$ Solve for y.

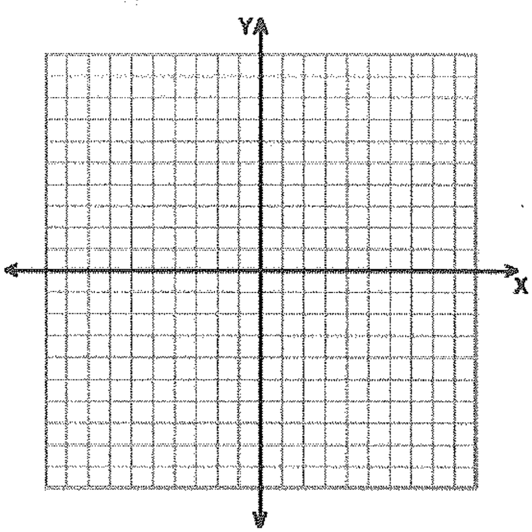
   Plot $(0, -2)$, the y-intercept.

4. Draw a line through the two points.

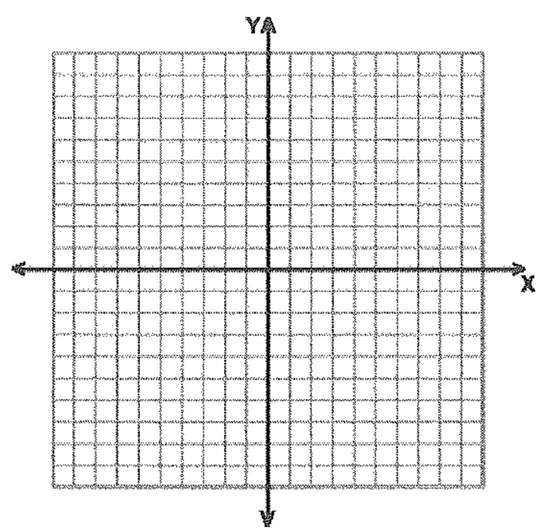


Graph the equation.

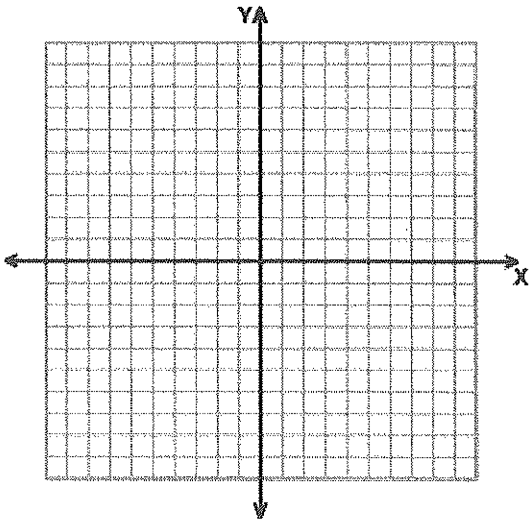
49. $-x + 4y = 8$



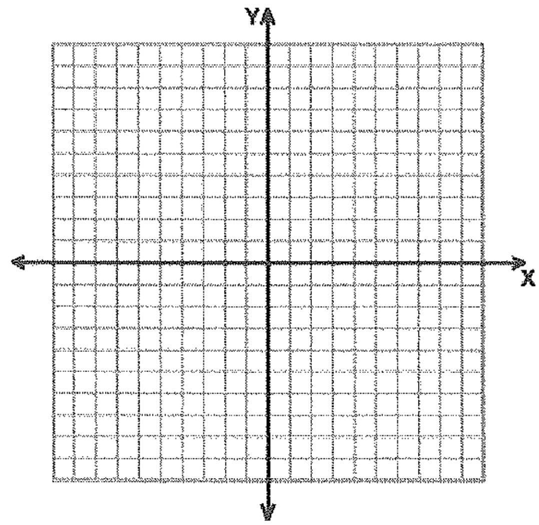
50. $2x - y = 4$



51. $x = -3$



52. $y = -6$



Graphing Linear Inequalities

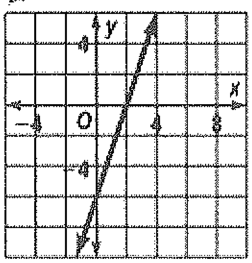
A **linear inequality** in two variables is an inequality whose graph is a region of the coordinate plane bounded by a line. This line is the **boundary**. If the boundary is included in the solution of the inequality, it is drawn as a solid line. If the boundary is not part of the solution of the inequality, it is drawn as a dashed line.

Problem

What is the graph of $6x - 2y \leq 12$?

$6x - 2y \leq 12$

$y \geq 3x - 6$



To graph the boundary line, write the inequality in slope-intercept form as if it were an equation.

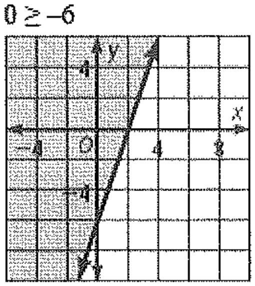
The boundary line is solid if the inequality contains ≤ or ≥. The boundary line is dashed if the inequality contains, < or >. Graph the boundary line y = 3x – 6 as a solid line.

$0 \geq 3(0) - 6$

Since the boundary line does not contain the origin, substitute the point (0, 0) into the inequality.

$0 \geq -6$

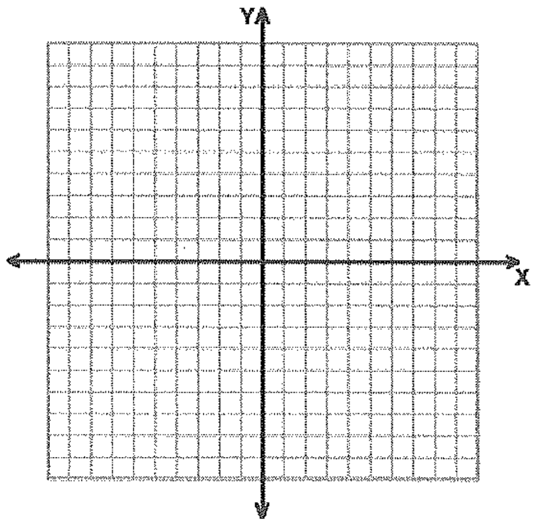
Simplify. The resulting inequality is true.



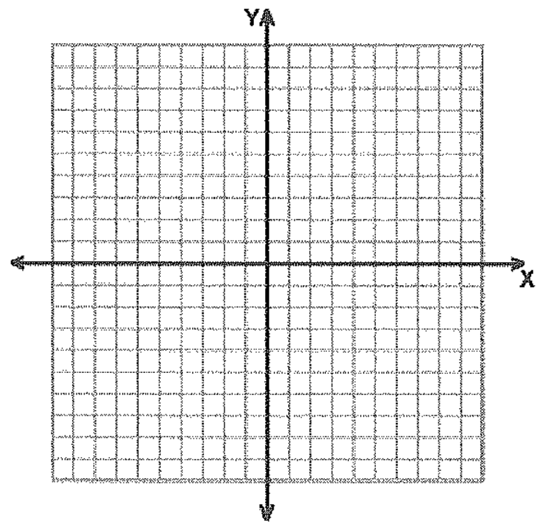
Shade the region that contains the origin. If the resulting inequality were false, then you would shade the region that does not contain the origin.

Graph each inequality.

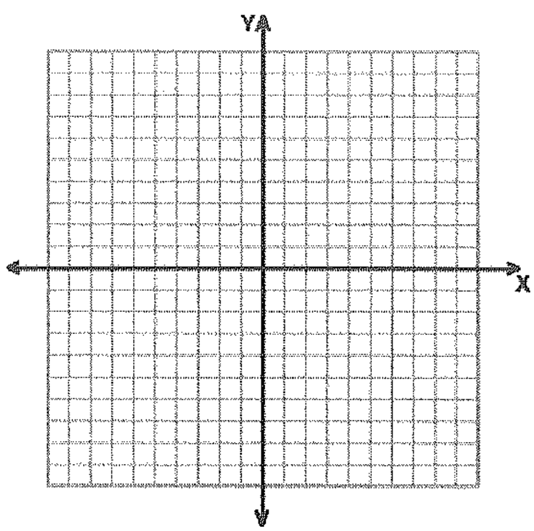
53. $y > 2x$



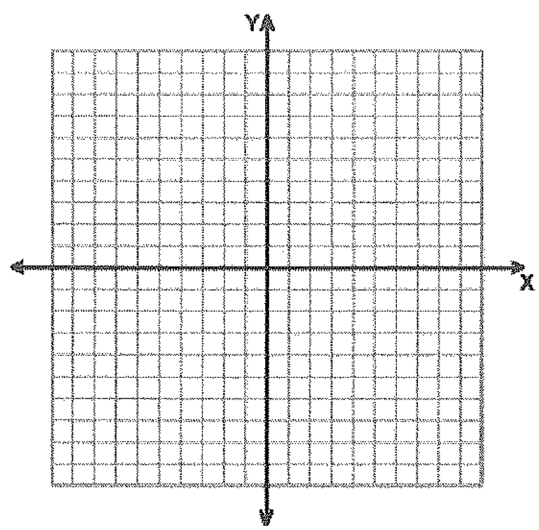
54. $x + y < 4$



55. $3x - 2 \le 5x + y$



56. $y \ge 5$



Solving Linear Systems

Follow these steps when solving by substitution.

Step 1 Solve one equation for one of the variables.

Step 2 Substitute the expression for this first variable into the other equation. Solve for the second variable.

Step 3 Substitute the second variable's value into either equation. Solve for the first variable.

Step 4 Check the solution in the other original equation.

Problem

What is the solution of the system of equations? $\begin{cases} 4x + 3y = 10 \\ x + 2y = 10 \end{cases}$

Step 1	$x = -2y + 10$	Solve one equation for x.
Step 2	$4(-2y + 10) + 3y = 10$	Substitute the expression for x into the other equation.
	$-8y + 40 + 3y = 10$	Distribute.
	$-5y = -30$	Combine like terms.
	$y = 6$	Solve for y.
Step 3	$x + 2(6) = 10$	Substitute the y value into either equation.
	$x + 12 = 10$	Simplify.
	$x = -2$	Solve for x.
Step 4	$4(-2) + 3(6)\ 0 \stackrel{?}{=} 10$	Check the solution in the other equation.
	$-8 + 18 \stackrel{?}{=} 10$	Simplify.
	$10 = 10$ ✓	

The solution is (−2, 6).

Solve each system by substitution.

57. $\begin{cases} x - 3y = 2 \\ -x + 2y = 5 \end{cases}$	58. $\begin{cases} a - 3b = 4 \\ a = -2 \end{cases}$

59. $\begin{cases} -2m + n = 6 \\ -7m + 6n = 1 \end{cases}$	60. $\begin{cases} 7x - 3y = -1 \\ x + 2y = 12 \end{cases}$

Follow these steps when solving by elimination.

Step 1 Arrange the equations with like terms in columns. Circle the like terms for which you want to obtain coefficients that are opposites.

Step 2 Multiply each term of one or both equations by an appropriate number.

Step 3 Add the equations.

Step 4 Solve for the remaining variable.

Step 5 Substitute the value obtained in step 4 into either of the original equations, and solve for the other variable.

Step 6 Check the solution in the other original equation.

Problem

What is the solution of the system of equations? $\begin{cases} 2x - 5y = 11 \\ 3x - 2y = -12 \end{cases}$

Step 1 $\quad 2x + 5y = 11$, $\quad 3x - 2y = -12$ — Circle the terms that you want to make opposite.

Step 2 $\quad 6x + 15y = 33$, $\quad -6x + 4y = 24$ — Multiply each term of the first equation by 3. Multiply each term of the second equation by –2.

Step 3 $\quad 19y = 57$ — Add the equations.

Step 4 $\quad y = 3$ — Solve for the remaining variable.

Step 5 $\quad 3x - 2(3) = -12$, $\quad x = -2$ — Substitute 3 for y to solve for *x*.

Step 6 $\quad 2(-2) + 5(3) \stackrel{?}{=} 11$, $\quad -4 + 15 \stackrel{?}{=} 11$, $\quad 11 = 11$ ✓ — Check using the other equation.

The solution is (–2, 3). You can also check the solution by using a graphing calculator.

Solve each system by substitution.

61. $\begin{cases} 3x + 2y = -17 \\ x - 3y = 9 \end{cases}$	62. $\begin{cases} 5f + 4m = 6 \\ -2f - 3m = -1 \end{cases}$
63. $\begin{cases} 3x - 2y = 5 \\ -6x + 4y = 7 \end{cases}$	64. $\begin{cases} -2x - 4y = 2 \\ 10x + 20y = -10 \end{cases}$