

[8.1: SOLVING SYSTEMS BY GRAPHING] 1

Write your questions here!

A **linear system**, or simply linear system, consists of two or more linear equations in the same variables. Here is an example:

$$\begin{aligned}x + 2y &= 7 \\3x - 2y &= 5\end{aligned}$$

Equation 1

Equation 2

The **solution** is the x and the y values that satisfy each equation. One way to find the solution is by graphing both equations and finding where they intersect.

Steps for Solving Linear Systems by Graphing

Step 1

- Write both equations in slope-intercept form and graph; Sections 4.4, "4 Shortcuts," and Section 5.4)

Step 2

- Find the coordinates of the point of intersection.

Step 3

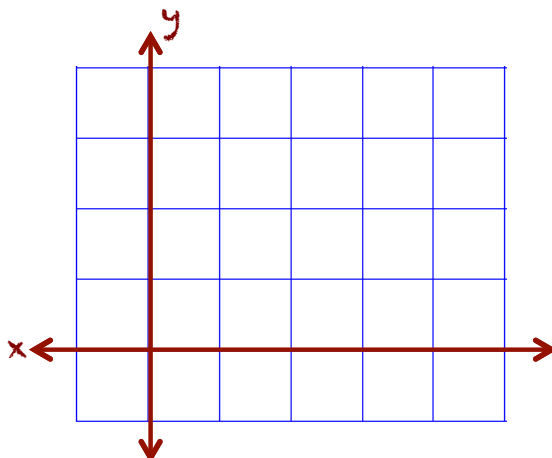
- Check the coordinates by substituting into the original equations.

Step 4

- Write your solution as a coordinate point.

Solve the following linear system by graphing:

$$\begin{aligned}y &= \frac{2}{3}x + 1 \\y &= 3\end{aligned}$$



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Solving Linear Systems with a Graphing Calculator

Let's be honest. You love our TI-84's! And as I have been explaining how to solve linear systems by hand, you were thinking "Can't I just do this in the calculator?" So here you go:

Example: Solve the linear system using a calculator:

$$y = -\frac{5}{2}x + 3$$

$$3y = x + 5$$



Step 1: Rewrite each equation in slope-intercept form.

$$y = -\frac{5}{2}x + 3$$

$$3y = x + 5$$

Step 2: Now, put each function into the calculator.

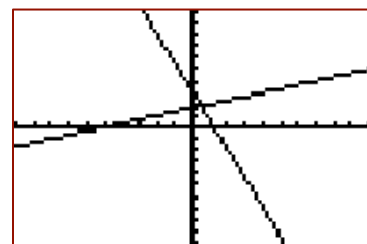
Keystrokes:

$Y=$ ((-) 5 ÷ 2) X,T,θ,n + 3 ▾
 (1 ÷ 3) X,T,θ,n + (5 ÷ 3)

```

Plot1 Plot2 Plot3
Y1 (-5/2)X+3
Y2 (1/3)X+(5/3)
Y3 =
Y4 =
Y5 =
Y6 =
Y7 =
  
```

Step 3: Pick a nice window (Usually $ZOOM$ 6 is a good starting point.) You may have to "Zoom Out" if you cannot see the lines by changing the window.



Step 4: Use the intersect function of your calculator to find the solution to the system:

Keystrokes:

2^{nd} TRACE 5 ENTER ENTER ENTER

```

Intersection
X=.47058824 Y=1.8235294
  
```

Notice that it now says $X = .47058824$ and $Y = 1.8235294$. These are your answers! Your solution would be $(0.47058824, 1.8235294)$.

You try the next two examples by yourself.

$$1. \quad \begin{aligned} y + x &= 11 \\ y &= -2x + \frac{77}{5} \end{aligned}$$

$$2. \quad \begin{aligned} 5y &= -15 - x \\ y &= 2x + 15 \end{aligned}$$



Sketch your
graphs here!



Step 5: Checking your solution.

To check your solution, plug x and y into the original equations!

Is $(4,3)$ a solution of the following systems of equations?

$$\begin{aligned} y &= 3x - 11 \\ x - y &= -1 \end{aligned}$$

$$\begin{aligned} x &= 4 \\ y &= x + 1 \end{aligned}$$

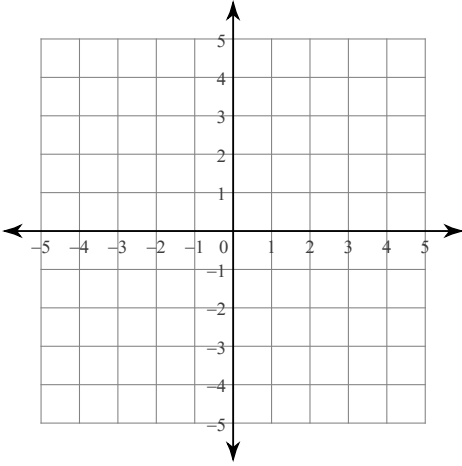
Now, summarize
your notes here!

Practice 8.1

Solve each system by graphing by hand.

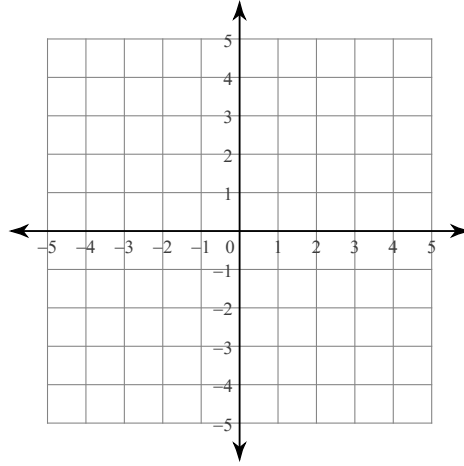
1) $y = \frac{8}{3}x + 4$

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

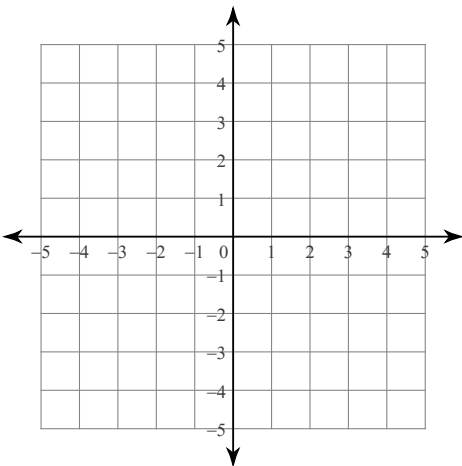


2) $y = \frac{1}{3}x + 1$

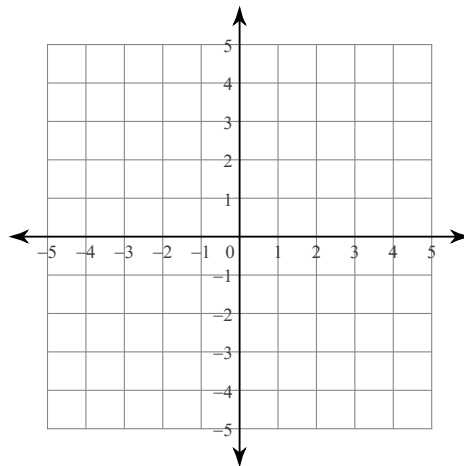
$y = -\frac{1}{3}x + 3$



3) $24 = -9x + 6y$
 $-12 - 4y = x$



4) $-2y + 8x = 2$
 $3y - 3x = 6$



Solve each system by graphing with your graphing calculator or by hand.

$$5) \begin{aligned} y &= -3x - 19 \\ y &= -\frac{7}{9}x + 1 \end{aligned}$$

$$6) \begin{aligned} y &= \frac{1}{3}x + 17 \\ y &= -\frac{4}{9}x + 10 \end{aligned}$$

$$7) \begin{aligned} y &= -\frac{1}{14}x + 19 \\ y &= \frac{17}{14}x + 1 \end{aligned}$$

$$8) \begin{aligned} y &= -\frac{2}{3}x + 15 \\ y &= \frac{7}{2}x - 10 \end{aligned}$$

9) Is the point (1, 2) a solution of the system of linear equations in # 7 above?

10) Is the point (-1, 3) a solution of the system of linear equations in # 8 above?

8.1: SOLVING SYSTEMS BY GRAPHING

Application and Extension

1. Solve the following system of equations using your calculator. Write your answers as fractions, if necessary.

a. $y = x + 2.5$
 $y - 2x = -0.5$

b. $y = 3x + 6$
 $-2y = 12x$

Solution _____

Solution _____

2. The Algebros thought it would be super-cool to start up a Twitter account (@TheAlgebros). When they created their account, they had 3 followers (their 3 mothers) and each day they added 4 followers. A rival Flippedmath group, "The Radicals," did the same, but started with 15 followers and added 1 follower per day.

Sketch your graph here!



TheAlgebros EQN: _____

TheRadicals EQN: _____

What is the solution to your system? _____

Hint: Adjust your window to:
X: $-5 \rightarrow 15$
Y: $-10 \rightarrow 60$

- a. How long will it take @TheAlgebros to have the same number of followers as The Radicals?
- b. How many followers will each group have after 1 year?

Coming Up: Evaluate each expression if $a = 4$, $b = -2$, $c = 10$, $x = -3$ and $y = -5$.

1. ab^2

2. $x^2 y^2$

3. $(xy)^2$

Quick Review: Find the slope of the line that passes through the given points.

1. $(-2, 3); (4, 11)$

2. $(-5, 3); (-5, 9)$

3. $(-1, 1.5); (4, 0.5)$