

[8.1: SOLVING SYSTEMS BY GRAPHING]

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:

$$x + 2y = 7$$

Equation 1

$$3x - 2y = 5$$

Equation 2

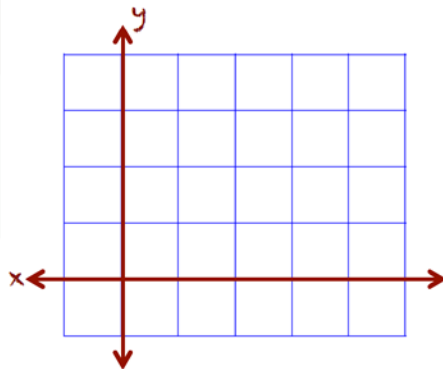
The solution is the x and the y values that satisfy each equation. One way to find the solution is by graphing both equations and finding where they intersect.

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:

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



[8.1: SOLVING SYSTEMS BY GRAPHING]

You try the next two examples by yourself.

1. $y + x = 11$
 $y = -2x + \frac{77}{5}$

2. $5y = -15 - x$
 $y = 2x + 15$



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!

Write your questions here!

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.

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

$$3y = x + 5$$

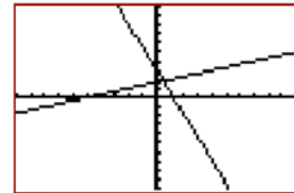
Step 2: Now, put each function into the calculator.

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:

2nd TRACE 5 ENTER ENTER ENTER

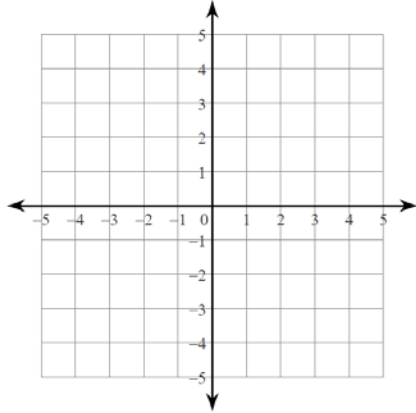
```
Intersection
X=.47058824 Y=1.8235294
```

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

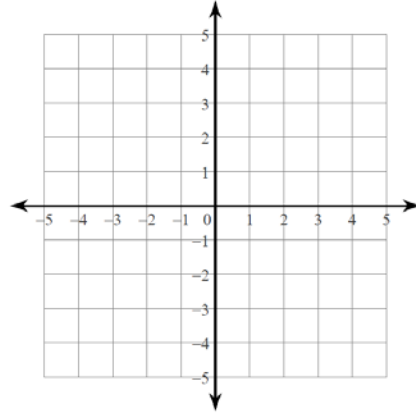
Practice 8.1

Solve each system by graphing by hand.

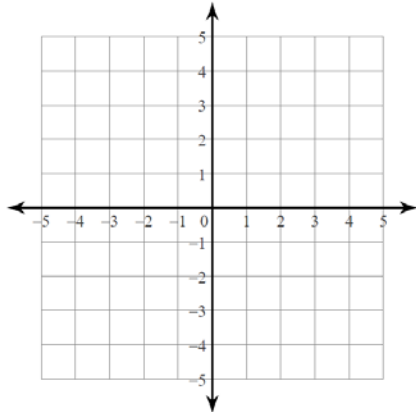
1) $y = \frac{8}{3}x + 4$
 $y = \frac{1}{3}x - 3$



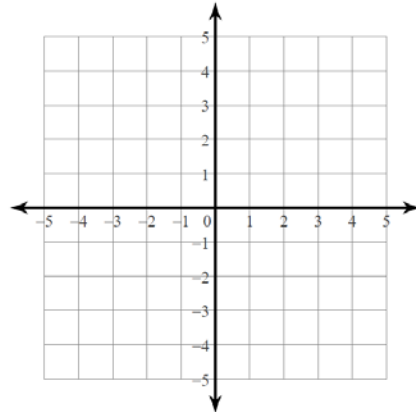
2) $y = \frac{1}{3}x + 1$
 $y = -\frac{1}{3}x + 3$



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?

Application and Extension

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 Equation: _____

TheRadicals Equation: _____

What is the solution to your system? _____

Hint: Adjust your window to:
X: $-5 \rightarrow 15$
Y: $-10 \rightarrow 50$

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?