

## [8.1: SOLVING SYSTEMS BY GRAPHING]

Write your questions here!

A                     , 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                                      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.

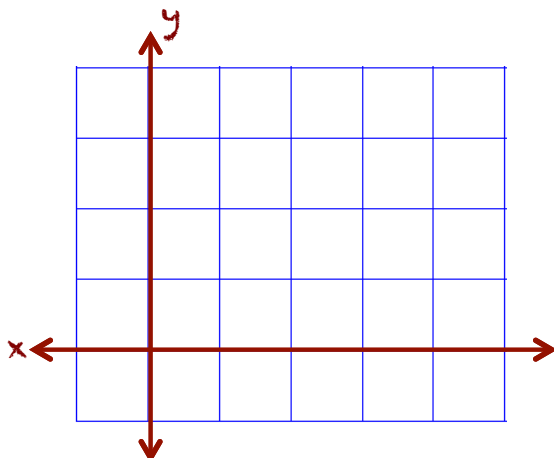
Step 4

- Write your solution as a coordinate point.

Solve the following linear system by graphing:

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

$$y = 3$$



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.

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

$$3y = x + 5$$

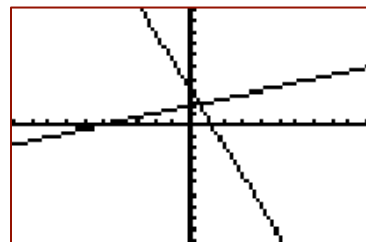
**Step 2:** Now, put each function into the calculator.

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=
```

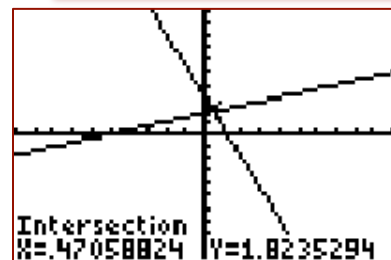
**Step 3:** Pick a nice window (Usually **ZOOM 6** is a good starting point.) You may have to "Zoom Out" if you cannot see the lines by changing the window.



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

Keystrokes:

2nd TRACE 5 ENTER ENTER ENTER



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

## [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!

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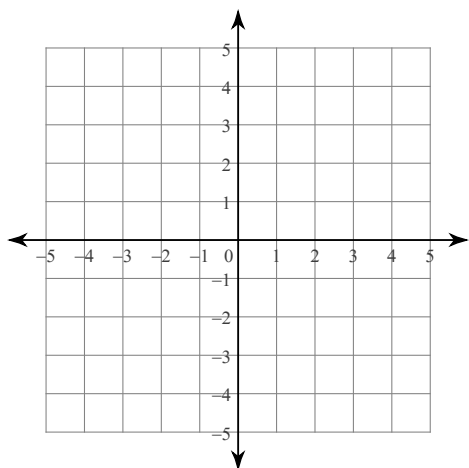
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## Practice 8.1

Solve each system by graphing by hand.

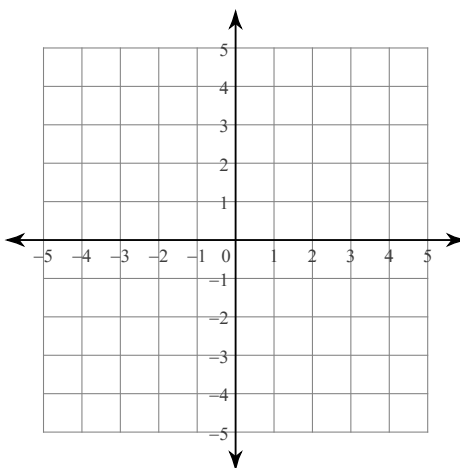
1)  $y = \frac{8}{3}x + 4$

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

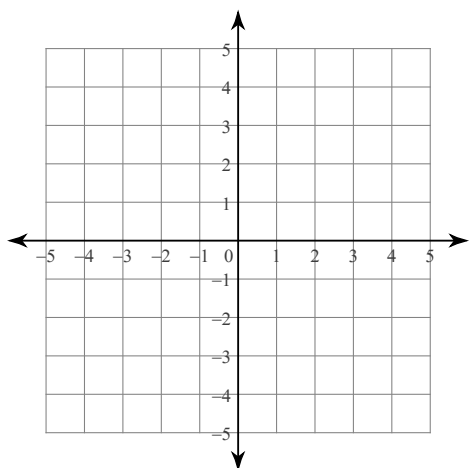


2)  $y = \frac{1}{3}x + 1$

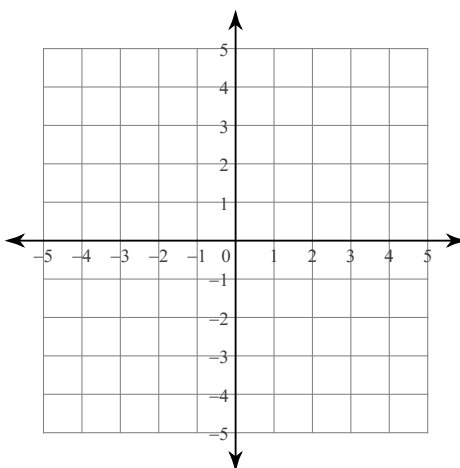
$$y = -\frac{1}{3}x + 3$$



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.**

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

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

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

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

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?

# 4 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.  $y = x + 2.5$   
 $y - 2x = -0.5$

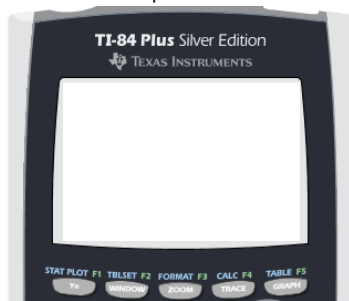
b.  $y = 3x + 6$   
 $-2y = 12x$

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!



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

TheAlgebros Equation: \_\_\_\_\_

TheRadicals Equation: \_\_\_\_\_

What is the solution to your system? \_\_\_\_\_

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?

Solve for x.	Evaluate if $x = -4$	Graph and label each line.
1. $-12 = \frac{3x}{4} - 2$	3. $x^2 + 3x$	5. Graph the line $y = 3x - 2$
2. $-28 = -20 - \frac{1x}{4}$	4. $7 - 6x^3$	6. Graph the line $y = -\frac{3}{2}x$

