

## Slope & y-Intercept Discovery Activity

**In this activity, you will use your TI-83 graphing calculator to graph equations of lines. Follow the steps below to guide you to discoveries about y-intercept and slope. Please be sure to record any data in the spaces provided and answer all questions.**

**Step 1:** Before we start entering and graphing equations of lines, we must access our graph menu and adjust the style of the lines we will graph so that we can tell them apart:



Access the graph menu by pressing  $\boxed{Y=}$ .

To access these style options, move the cursor using the arrows keys in the top right corner of the keypad all the way to the left and you will see the option blinking.

For Y1, press  $\boxed{\text{ENTER}}$  until the dotted line option appears. It should appear after pressing  $\boxed{\text{ENTER}}$  six times and looks like this: `.

Move the cursor over this location. As you hit enter the display will change

Leave Y2 at the normal line style: `.

For Y3, press  $\boxed{\text{ENTER}}$  until the thick line option appears. It should appear after pressing  $\boxed{\text{ENTER}}$  once and looks like this: `.



**Step 2:** Now, we must enter three equations of lines into our TI-83 graphing calculator. Enter the following equations as Y1, Y2, and Y3 respectively. To get to the next line on the screen, press  $\boxed{\text{ENTER}}$ :

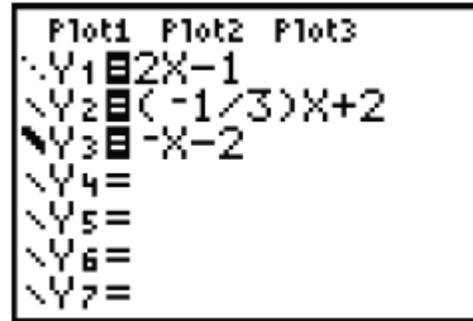
$$y = 2x - 1$$

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

$$y = -x - 2$$

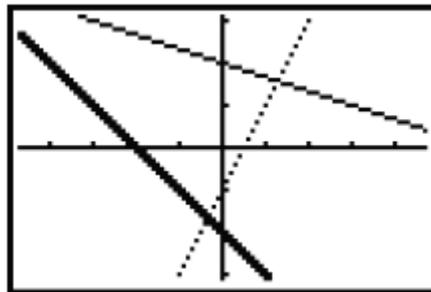
To type the variable you can use the variable key  $\boxed{X,T,\theta,n}$ .

Once *Step 2* is complete your screen should look like the one to the right. Be sure that you are using the  $\boxed{-}$  button when indicating that there is a negative value. This should clarify any confusion as to how to enter the equation into your calculator.



**What do you notice about the form of the 3 equations? In your own words, what are the similarities?**

**Step 3:** To graph the lines of these equations press the  $\boxed{\text{GRAPH}}$  button. Once the lines are graphed, press the  $\boxed{\text{ZOOM}}$  button. A new screen will appear. Press  $\boxed{4}$  to select the ZDecimal option. Your screen should now look like this:



**Step 4:** Now press the  $\boxed{\text{TRACE}}$  button. Notice that in the upper left hand corner of the screen, it displays the equation you are tracing. At the bottom of the screen it shows you the  $x$ - and  $y$ -coordinates of the point with the flashing cursor.

Press the right cursor arrow once, twice, three times. You should notice that the  $x$ -coordinates are increasing by .1 each time.

Press the right cursor arrow until  $x = .5$ . Then press the down cursor arrow and you will notice that the flashing cursor "jumps" to the graph of  $Y_2$  -- with the same  $x$ -coordinate (.5) but a different  $y$ -coordinate.

Press the down cursor arrow again and the cursor jumps to the graph of  $Y_3$  -- also

with a different  $y$ -coordinate.

Practice jumping from line to line. Also use the left and right cursor arrows to move along the lines. Notice how the  $x$  and  $y$  values change together at the bottom of the screen.

**Step 5:** Let's get back to the graph of Y1. Press the up cursor arrow to return there. You'll know you're there because the equation will be displayed in the upper left hand corner of your screen. Now press  $\boxed{0}$  (the zero button) and then  $\boxed{\text{ENTER}}$ . This will take your cursor to the point on Y1 where  $x = 0$ .

This is the point where the graph of Y1 crosses the  $y$ -axis. Notice the  $x$  and  $y$  displayed at the bottom of the screen.

The  $y$ -value when  $x$  is 0 is known as the  **$y$ -intercept**. Use your TI-83 to fill in the following information:

**$y$ -intercept for the graph of Y1:** \_\_\_\_\_

**$y$ -intercept for the graph of Y2:** \_\_\_\_\_

**$y$ -intercept for the graph of Y3:** \_\_\_\_\_

**Do you see a connection between the  $y$ -intercept values and the equations for Y1, Y2, and Y3? In your own words, what is the connection?**

**Step 6:** Now let's look at another equation. But first we must clear out the equations we used before. Press  $\boxed{Y=}$  and then press  $\boxed{\text{CLEAR}}$  until all equations should be gone.

While we are in the  $\boxed{Y=}$  screen, let's change the style of the line for Y1 back to the normal line setting. Do you remember how to do this? If you need a hint, look back at STEP 1.

We are now going to graph the equation  $6x + 7y = 21$ . **BUT WAIT!!!!**

**How is this equation different from the equations we used in Step 2? Would we be able to enter this equation into our TI-83 in this form?**



MAKE SURE YOU'VE ANSWERED ALL QUESTIONS. COMPARE YOUR ANSWERS WITH PERSON SITTING NEXT TO YOU. ONCE ALL QUESTIONS ARE ANSWERED YOU MAY PROCEED.

**Step 7:** As you may have realized when answering the question in Step 6, we need to change the form of this equation. Solve the equation for  $y$  in terms of  $x$ . **SHOW YOUR WORK!**

$$6x + 7y = 21$$

**CIRCLE which equation you got when you solved for  $y$ .** If you didn't get one of the 3 choices go back and check your algebra.

a.  $y = -\frac{6}{7}x + 3$

b.  $y = \frac{7}{6}x + 21$

c.  $y = \frac{6}{7}x - 14$

**Step 8:** Each of the three choices above is an equation for a line in **slope-intercept form**. Hopefully your algebra is correct and you selected the right solution. But even if you didn't, which you won't know until this is graded, you can still proceed with the activity as long as you were able to arrive at one of the above answers.

Now enter your equation into your TI-83 and graph the line. If you need a hint, take a look back at STEP 2 and STEP 3.

Once the GRAPH screen appears, press the **ZOOM** button and select option 6: ZStandard.

**By just looking at the equation of the line, what is the  $y$ -intercept?** \_\_\_\_\_

Use the **TRACE** button to verify your answer.

**Step 9:** We will now use the TRACE function to determine two points that lie on this line. We have already determined one point, where  $x = 0$ . Use TRACE to determine another point on the line and record your points below.

$(x_1, y_1) = ( 0, \underline{\hspace{2cm}} )$

$(x_2, y_2) = ( \underline{\hspace{2cm}}, \underline{\hspace{2cm}} )$

**Step 10:** It is time to find the **slope** of this line. To do so, we use the points from the line we graphed and enter the values into the **slope formula**:

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

**Try and define slope in your own words, based on the formula for slope.**

Now use your TI-83 to get a value for slope. To leave the graphing mode of your calculator, press  $\boxed{2\text{nd}}\boxed{\text{MODE}}$ . Your answer will be in the form of a decimal. Don't delete your answer from the calculator – we'll need it for the next step. Record the slope of your line below:

**Slope:** \_\_\_\_\_

**Compare your slope answer with the person sitting next to you. Did they use the same two points as you? Did they arrive at the same value for slope?**

**Step 11:** Turn the decimal number you got for slope into a fraction. But don't use your brain – use your handy dandy TI-83. Here's how:

Your answer for slope should be the last thing on your screen, if not, do the slope calculation again. Then press the  $\boxed{\text{MATH}}$  button and the following screen will appear:



Press the  $\boxed{1}$  (one) button to select **Frac**. This function turns a decimal into a fraction. Press  $\boxed{\text{ENTER}}$  and your decimal should now be displayed as a fraction. Re-write the slope of the line as a fraction:

**Slope:** \_\_\_\_\_

**Where have you seen this fraction before?**

**What general statement can you make about the numbers that make up an equation in slope-intercept form?**

**Go back to the equations in Step 2 and find the slope of those lines. Does this information support the general statement you made about slope-intercept form? If not, then write a new general statement about slope-intercept form. (HINT: why do you think it is called *slope-intercept form*?)**