SLOPE & y-INTERCEPT EXPERIMENT
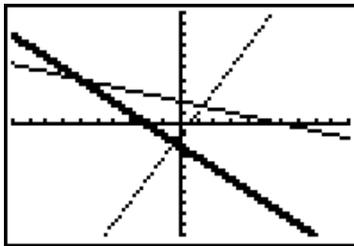
1. Clear out the equations stored in y =.

2. Enter the following equations into the y = menu and use the given format:
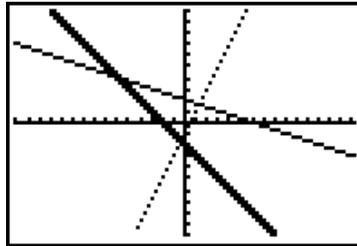
```
Plot1  Plot2  Plot3
\Y1■2X-1
\Y2■(-1/3)X+2
\Y3■-X-2
\Y4=
\Y5=
\Y6=
\Y7=
```

3. To graph these equations, use the following ZOOM options. For each, record the window dimensions:
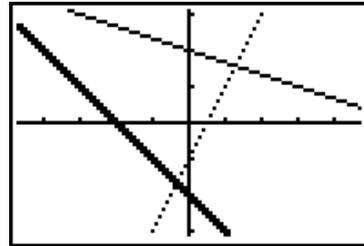
ZOOM 6 (Standard)   ZOOM 5 (Square)   ZOOM 4 (Decimal)

4. While still in ZOOM 4 (Decimal), press TRACE. 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.

5. Using the cursor arrows, get back to the point where x = 0 on the graph of y_1. You will notice that this point is where the graph crosses the y-axis, called the **y-intercept**. Press the down cursor once and you will be at the y-intercept for y_2, and press the down cursor once more and you will be at the y-intercept for y_3.

What do you notice for the x-coordinate for every y-intercept?

Record the values of the y-intercept for each equation and look at the equation. What relationship do you see?

Write the relationship down in your own words. Test your hypothesis by graphing a couple more linear equations.

6. Clear out all equations in y =. Let's graph the equation: 6x + 7y = 21. First we have to solve for y in terms of x:

$$7y \;=\; -6x+21$$

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

Enter this equation for y_1 and ZOOM Standard.

First of all you should notice that the graph of this line crosses the y-axis at 3. That is what we just learned from the previous example (#5). You should also notice that the line slants downhill from left to right, so its slope is what type of number (positive or negative)?

7. We are now going to use the calculator and the slope formula to help us compute the slope of the line -- or at least approximate the slope.

We will pick any two points off the line and store the values for their coordinates in (A, B) and (C, D). We will then use the slope formula to calculate a numerical value for the slope.

Press the TRACE key and cursor to the right, let's say, 7 times. 2nd MODE (QUIT). The values stored in the variables X and Y are the coordinates of the last point you traced. To see this press ALPHA STO (X) (or just the X,T,θ,n key), and ALPHA 1 (Y). Let's store those coordinates into A and B respectively:

        X   STO   ALPHA MATH (A)   <ENTER>
        ALPHA 1 (Y)   STO   ALPHA MATRIX (B)   <ENTER>

The x- and y-coordinates are now stored in (A , B).

Press GRAPH, TRACE, press the left cursor arrow about 10 times. 2nd MODE (QUIT). This time store the x-coordinate into C, and the y-coordinate into D.

The x- and y-coordinates are now stored in (C , D).

Using the slope formula: $m = \dfrac{\Delta y}{\Delta x} = \dfrac{y_2 - y_1}{x_2 - x_1}$, compute the slope with your

calculator and store the result into M.

Enter: (D - B)/(C - A)   STO   M   <ENTER>

What a terrible looking number! But it's no wonder. Look at the x- and y-coordinates we used. But this decimal should be a very good approximation to the slope of the line.

  8. Let's try to convert this decimal to a fraction by pressing   MATH   1 Frac. Does this fraction look familiar? Have you seen it recently? Where? Is this a coincidence?

  9. It is not good to make a generalization based on just one case. So make up your own equation -- different from anyone else and go through steps 6 - 8 using your equation. If possible, now make a generalization.

10. If you have a linear equation and you solve the equation for y in terms of x:

$$y = k x + c$$
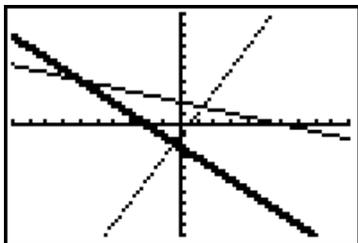
What does   **k**   always represent?

What does   **c**   always represent?

Instead of using k and c, what letters are usually used?

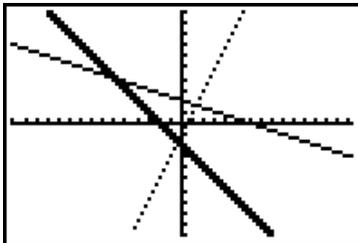# SLOPE & y-INTERCEPT EXPERIMENT
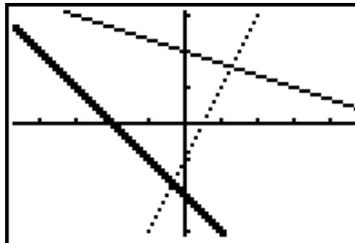## Teacher's Solutions and Ideas

3.

ZOOM 6 (Standard) ZOOM 5 (Square) ZOOM 4 (Decimal)

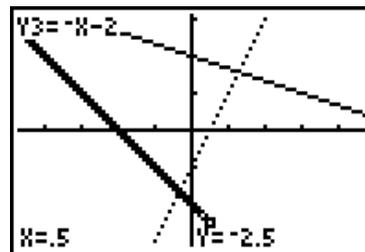

X [-10, 10] $_1$ X [-15.16..., 15.16...] $_1$ X [- 4.7, 4.7] $_{.1}$
Y [-10, 10] $_1$ Y [-10,10] $_1$ Y [- 3.1, 3.1] $_{.1}$

4.

5.
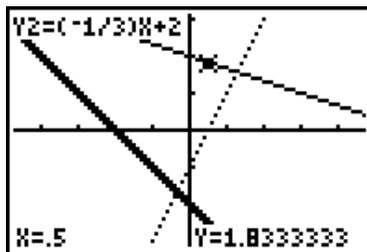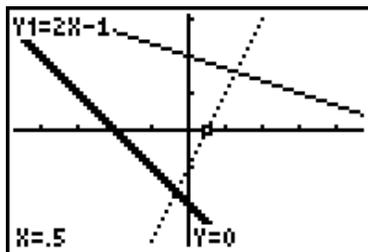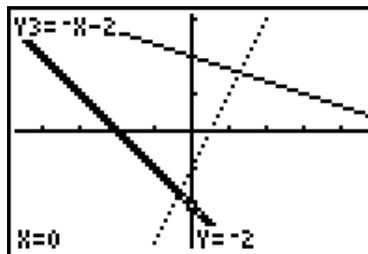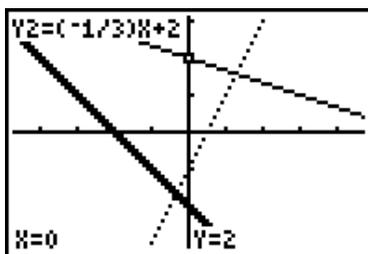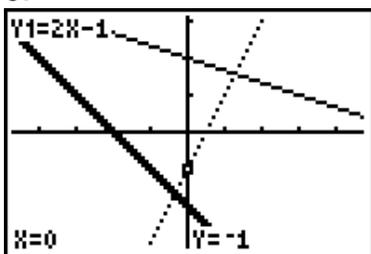
y-intercept is -1   y-intercept is 2   y-intercept is -2
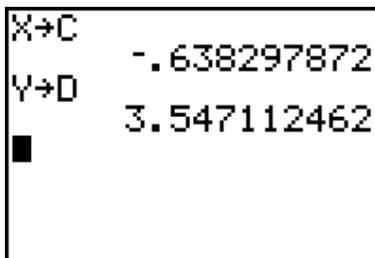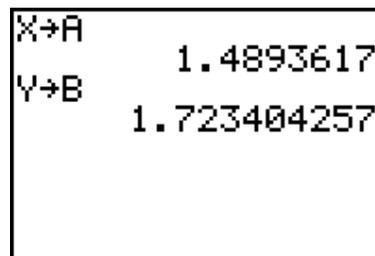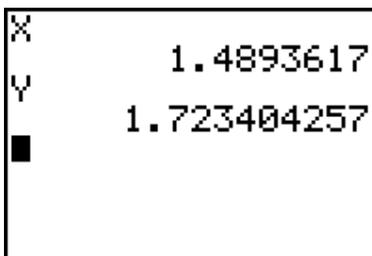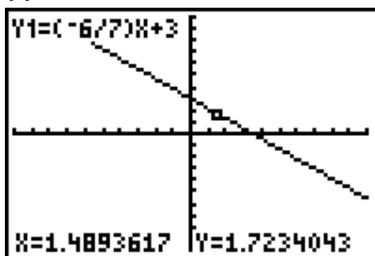x-coordinate = 0   x-coordinate = 0   x-coordinate = 0

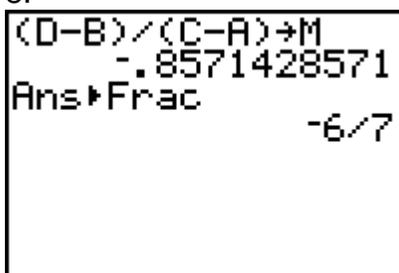Hopefully the students will make a general statement like: the y-intercept is the number added to the x term.

6.
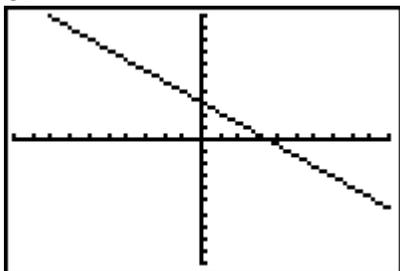
The student should notice that the y-intercept is 3 and that the line slants downhill so it has a negative slope.

7.

Y1=(⁻6/7)X+3

X=1.4893617 Y=1.7234043

X
Y
■
    1.4893617

    1.723404257

X→A
Y→B
    1.4893617

    1.723404257

X→C
Y→D
■
    -.638297872

    3.547112462

(D−B)/(C−A)→M
    -.8571428571

8.

(D−B)/(C−A)→M
    -.8571428571
Ans▶Frac
    -6/7

YES this fraction looks familiar!
-6/7 is the coefficient of x in the equation y = -6/7x + 3
THIS IS A POWERFUL TEACHING MOMENT.
BASK IN IT.

10. k is the slope.   c is the y-intercept. We usually use y = m x + b !