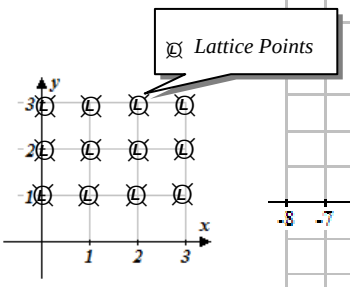
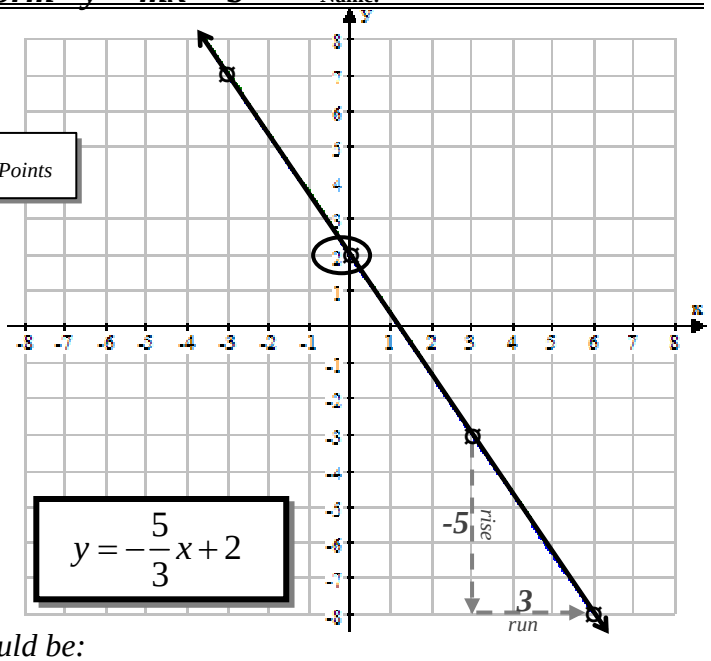
Investigating Graphed Lines of the form y = mx + b

Name:

Finding the equation of a graphed line in slope-intercept form (with a rational slope) can be described in a few simple steps.



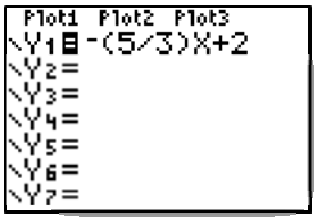
1. First, locate the lattice points (⊙) the line passes through (lattice points are points where both coordinates are integers or where the grid line of the graph intersect at the right)



2. Next, find the vertical distance (*the rise*) and the horizontal distance (*the run*) from one lattice point to the next. This will help to determine the slope. Be careful to note, that moving down or left will be negative.

   In the example shown at the right the slope of the line would be:

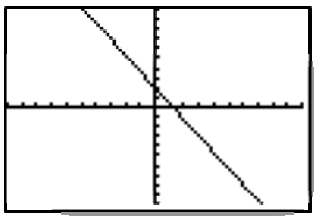
$$slope(m) = \frac{change\ in\ y}{change\ in\ x} = \frac{the\ rise}{the\ run} = \frac{-5}{3}$$



3. Finally, locate the y-intercept (the place where the line crosses the ↑ y-axis).

   *In the example shown at the right the y-intercept of the line would be **2**.*
   The slope-intercept equation that describes the line would be given by:

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



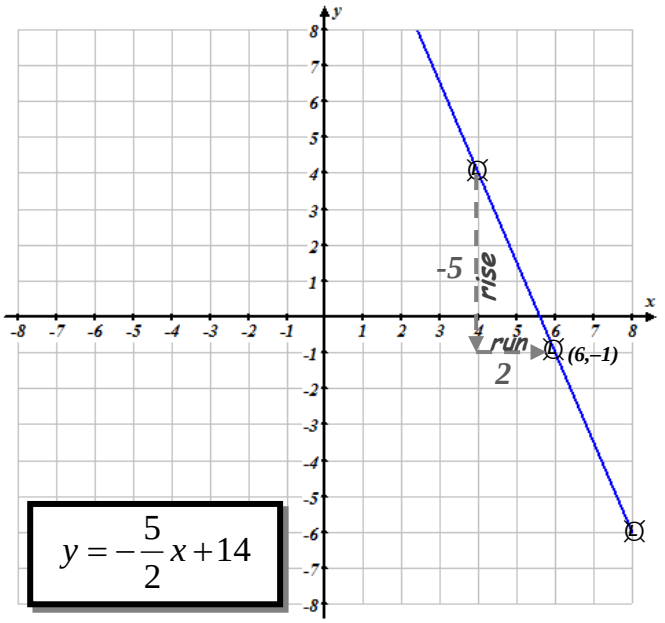
Try verifying the results with your graphing calculator.

- Press [Y =] and type in the equation as follows:

  [(–)], [(], [5], [/], [3], [)], [+], [2].

- Press [GRAPH]

Occasionally, the y-intercept may not be easy to determine because where the line intersects the y-axis might not be visible on the graph paper.



In this example we can still determine slope:

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

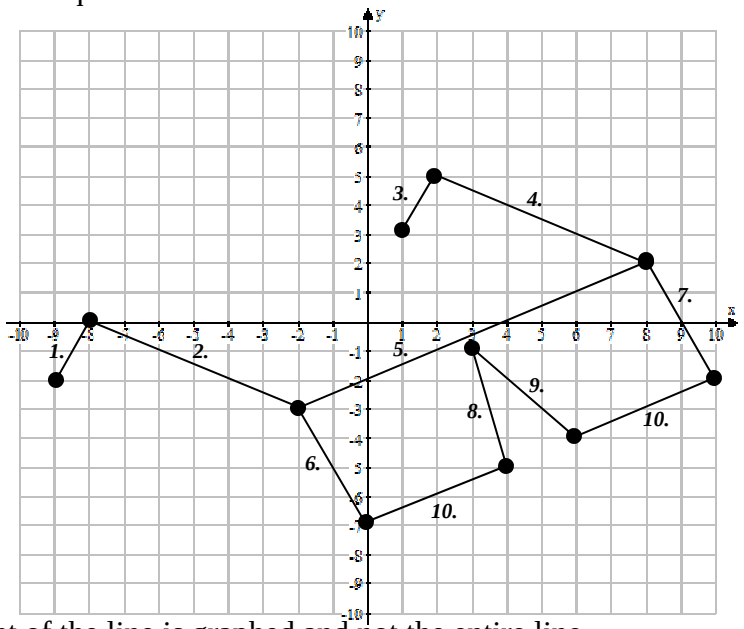
However, to determine the y-intercept (b) we could temporarily substitute 'x' and 'y' with the coordinates of one of the lattice points that the line passes through. For this example let's try (6, –1)

$(-1) = -\frac{5}{2}(6) + b$ which suggests $-1 = -15 + b$

So, 'b' must be equal to 14

Using the slope-intercept equation form of each line, write the equation of each one of the lines that would contain the segments that make up the picture of the sun glasses.

1. y = 2x + 16
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____



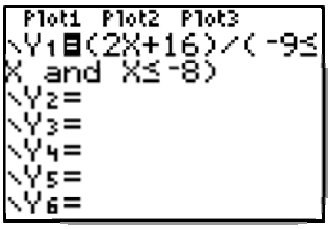
Next, we can enter the equations in our graphing calculator using domain constraints so that only the segment of the line is graphed and not the entire line.

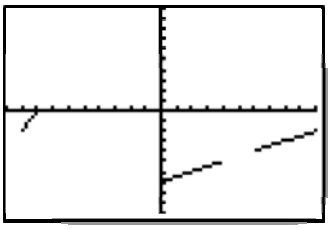
For example, the equation of line #1 is $y = 2x + 16$ but we only want to display the part of the line where $-9 \leq x \leq -8$. The calculator doesn't correctly interpret compound inequality statements written like the previous statement so it will need to be re written as $-9 \leq x \text{ and } x \leq -8$. The inequalities, and logic statements "and" & "or" can be found by pressing 2nd , MATH

$$Y_1 = \frac{2x+16}{-9 \leq x \text{ and } x \leq -8}$$

$$\vdots$$

$$Y_0 = \frac{\frac{1}{2}x - 7}{(0 \leq x \text{ and } x \leq 4) \text{ or } (6 \leq x \text{ and } x \leq 10)}$$





***This works because when the denominator is TRUE the calculator assigns a binary value of 1 and when the statement is FALSE it assigns a value of 0. So, effectively when the computer divides by 1 nothing happens to the original equation. However, when the calculator attempts to divide by 0 the equation is undefined and therefore doesn't graph anything.*

Put each of the following equations in slope intercept form and graph using the constraints listed. What does the picture show?

a. $y = 4x + 25 \quad (x \geq -5 \quad and \quad x \leq -4)$ _____

b. $4x + y = -16 \quad (x \geq -6 \quad and \quad x \leq -5)$ _____

c. $2y - 16 = 6x \quad (x \geq -4 \quad and \quad x \leq -2)$ _____

d. $3y + 12x = 87 \quad (x \geq 8 \quad and \quad x \leq 9)$ _____

e. $6x = 2y - 52 \quad (x \geq -8 \quad and \quad x \leq -6)$ _____

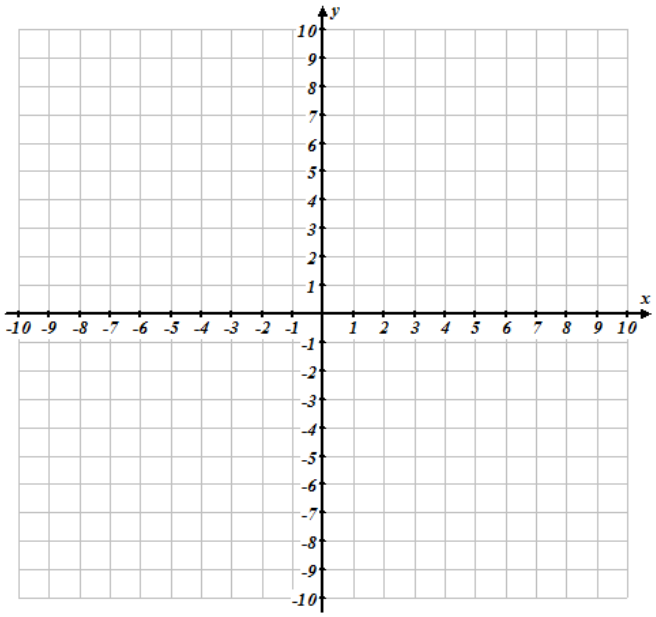
f. $y = -1 \quad (x \geq -3 \quad and \quad x \leq -1)$ _____

g. $y + 4x = -6 \quad (x \geq -3.5 \quad and \quad x \leq 0)$ _____

h. $y = -3 \quad (x \geq 1 \quad and \quad x \leq 8)$ _____

i. $y = -8x + 49 \quad (x \geq 6 \quad and \quad x \leq 7)$ _____

j. $44 = 4y + 24x \quad (x \geq 2 \quad and \quad x \leq 3)$ _____



Describe each of the equations below and graph in the calculator using **DRAWF**.

1. _____
2. _____
3. _____
4. _____
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