

## 4.6 Graph Linear Equations

### Key Terms and Concepts

#### Graphing an equation in slope-intercept form

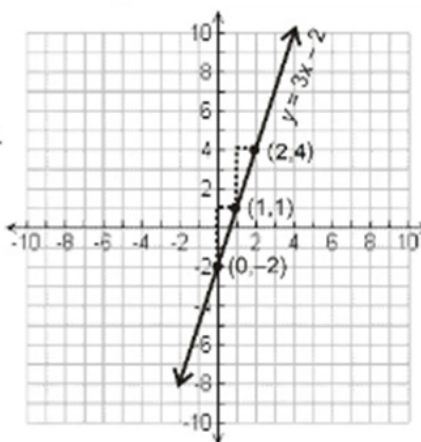
If given an equation in the form  $y = mx + b$ , the line can be graphed by following these steps:

- (A) Use the  $y$ -intercept to plot the point  $(0, b)$  on the  $y$ -axis.
- (B) Use the slope to determine at least two more points.
- (C) Draw a line through the points and label the line with the equation.

Example:

For the equation  $y = 3x - 2$ ,  
 the slope  $m = 3$  and the  $y$ -intercept  $b = -2$ .  
 The  $y$ -intercept of  $-2$  gives us the starting point,  $(0, -2)$ .  
 Since the slope  $m = 3 = \frac{3}{1} = \frac{\text{rise}}{\text{run}}$ ,  
 use the rise of 3 and run of 1 to get two more points,  
 $(1, 1)$  and  $(2, 4)$ .

Some students like to remember that  $b$  tells us a point to *begin* graphing the line and the  $m$  tells us how to *move* to find other points on the line.



We can also **graph the line using the calculator**:

1. Write the equation in slope-intercept form.
2. Enter the equation by pressing the  $\boxed{Y=}$  button, then the right side of the equation and  $\boxed{\text{ENTER}}$ . Use  $\boxed{\text{ALPHA}}$   $\boxed{[X]}$  to enter the variable  $x$ .
3. Press  $\boxed{\text{ZOOM}}$   $\boxed{\text{ZStandard}}$   $\boxed{\text{ENTER}}$ .



Example: For the equation  $y = 3x - 2$ , enter  
 $\boxed{Y=}$   $3$   $\boxed{\text{ALPHA}}$   $\boxed{[X]}$   $- 2$   $\boxed{\text{ENTER}}$   $\boxed{\text{ZOOM}}$   $\boxed{\text{ZStandard}}$   $\boxed{\text{ENTER}}$ .

**Notes:** (a) After pressing the  $\boxed{Y=}$  button, if any of the Plots at the top of the screen are highlighted, use the arrow keys to move to them and press  $\boxed{\text{ENTER}}$  to turn them off.

(b) The **ZStandard** function on the calculator sets the grid size to 20 by 20 units centered at the origin. For graphs that may not display well in the standard grid size, you may need to adjust the **Window** size. Press  $\boxed{\text{WINDOW}}$  and enter values for  $\boxed{\text{Xmin}}$  and  $\boxed{\text{Xmax}}$ , and also values for  $\boxed{\text{Ymin}}$  and  $\boxed{\text{Ymax}}$ . Then press  $\boxed{\text{GRAPH}}$  instead of  $\boxed{\text{ZOOM}}$   $\boxed{\text{ZStandard}}$ .

To view a table of points on the line: Press  $\boxed{2\text{nd}} \boxed{[\text{TABLE}]}$ . You can then scroll up or down with the arrow keys  $\boxed{\uparrow} \boxed{\downarrow}$  to see more points. If you'd like to see both the graph and the table on the same screen, press  $\boxed{[\text{MODE}]}$ , then scroll down and change from  $\boxed{\text{Full}}$  to  $\boxed{\text{G-T}}$ .

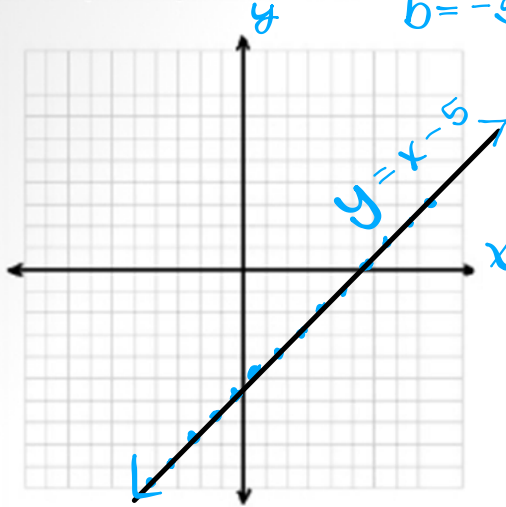


Note: You can specify which values of  $x$  the calculator will use for its table. To do so, press  $\boxed{2\text{nd}} \boxed{[\text{TBLSET}]}$ , then enter values for  $\boxed{\text{TblStart}}$  and  $\boxed{\Delta\text{Tbl}}$ . For example, if you want the table to start at  $x = -5$  and to use increments of 1, enter  $\boxed{\text{TblStart} = -5}$  and  $\boxed{\Delta\text{Tbl} = 1}$ .

Practice Problems

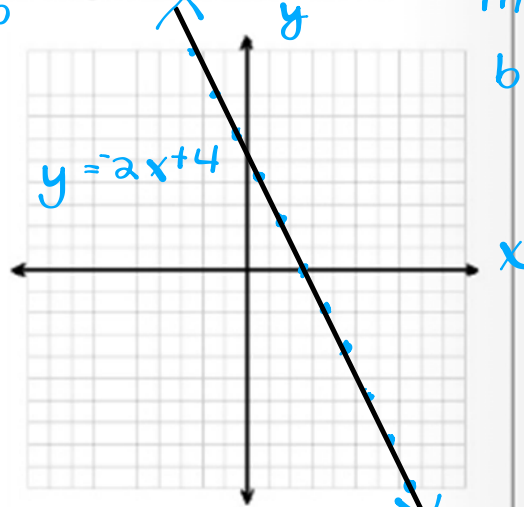
$y = m \cdot x + b \rightarrow$  y-intercept  
 slope

1. Graph the equation  $y = x - 5$ .



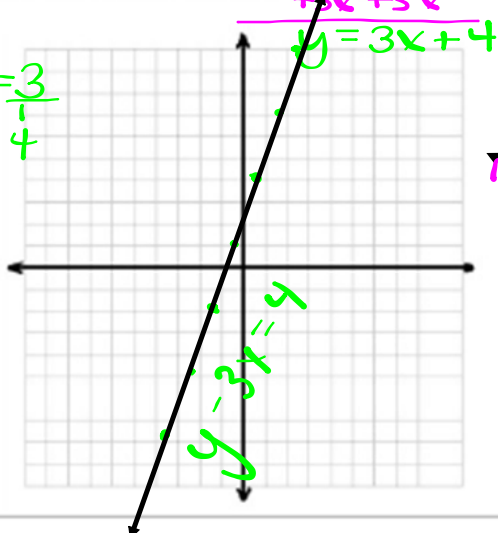
$m = 1$   
 $b = -5$

2. Graph the equation  $y = -2x + 4$ .



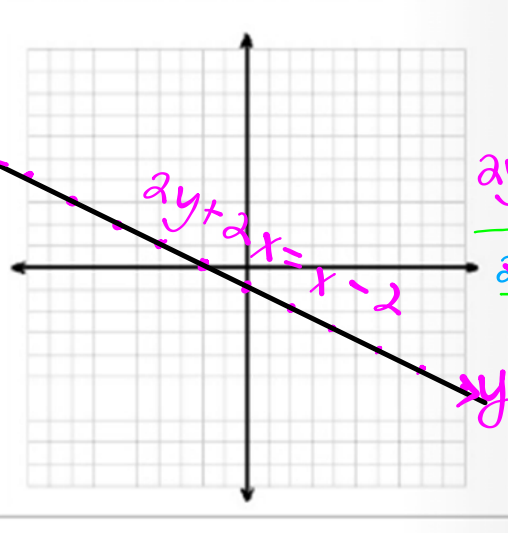
$m = -2$   
 $b = 4$

3. Graph the equation  $y - 3x = 4$ .



$m = 3$   
 $b = 4$

4. Graph the equation  $2y + 2x = x - 2$ .



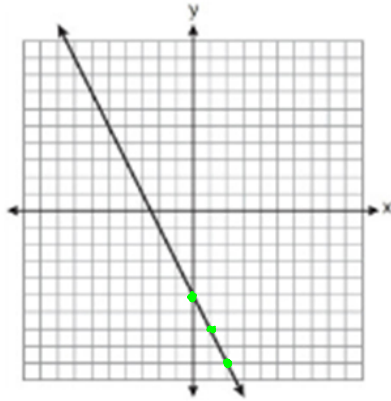
y-int  
 $y = m \cdot x + b$   
 slope

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

REGENTS QUESTIONS

Multiple Choice

1. Which equation is represented by the graph below?



$m = -\frac{2}{1}$   
 $b = -5$

~~$2y = -4x - 10$~~   
 $y = -2x - 5$   
 (m)      (b)

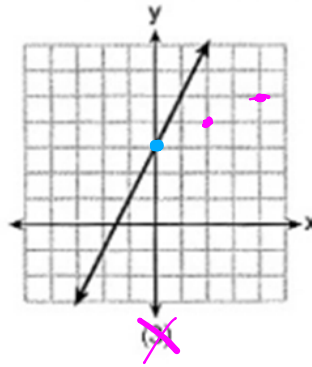
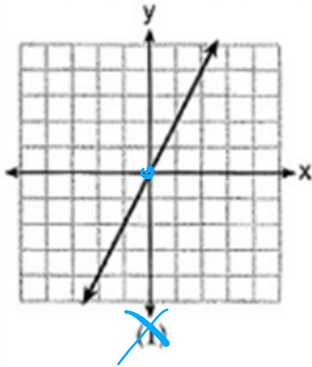
(1)  $2y + x = 10$

(2)  $y - 2x = -5$

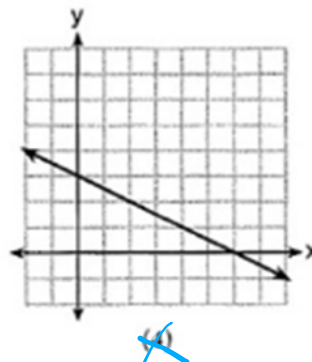
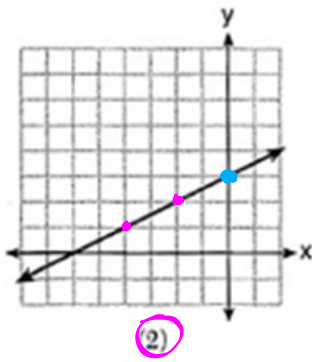
(3)  $-2y = 10x - 4$

(4)  $2y = -4x - 10$

2. (CC) Which graph shows a line where each value of  $y$  is three more than half of  $x$ ?

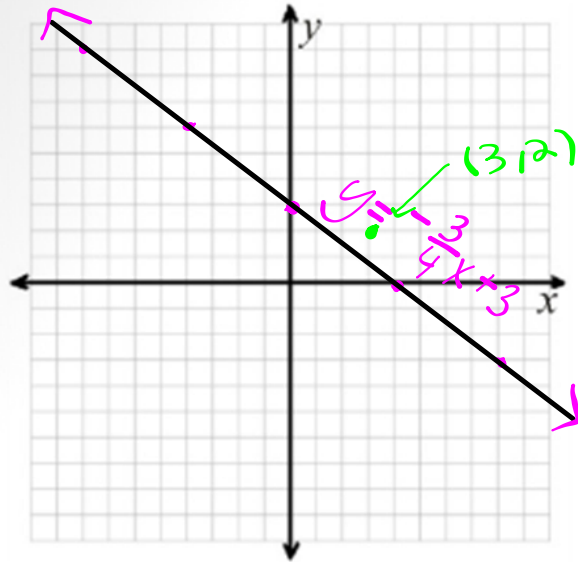


$y = \frac{1}{2}x + 3$   
 $m = \frac{1}{2}$   
 $b = 3$



Constructed Response

3. **CC** On the set of axes below, draw the graph of the equation  $y = -\frac{3}{4}x + 3$ .



$$m = -\frac{3}{4}$$

$$b = 3$$

$$\begin{matrix} x & y \\ (3, & 2) \end{matrix}$$

Is the point (3,2) a solution to the equation? Explain your answer based on the graph drawn.

No, it is not on the line  $y = -\frac{3}{4}x + 3$ .