

## 4.02 Slope-Intercept Graphing of a Line

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ANSWERS TO ALL EXERCISES ARE INCLUDED AT THE END OF THIS PAGE

### Y-INTERCEPTS

#### DEFINITIONS

X-intercept: where the graph crosses the X-axis ( $Y=0$ )

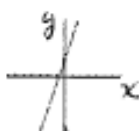
Y-intercept: where the graph crosses the Y-axis ( $X=0$ )

Now, look at each of the following equations and their graphs.

A)  $Y = X + 2$



B)  $Y = 3X + 2$



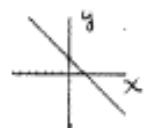
C)  $Y = 5X + 2$



D)  $Y = \frac{1}{2}X + 2$



E)  $Y = -X + 2$



F)  $Y = -3X + 2$



G)  $Y = -5X + 2$



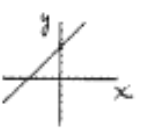
H)  $Y = -\frac{1}{2}X + 2$



1a) What do the above equations have in common? \_\_\_\_\_

b) What do the above graphs have in common? \_\_\_\_\_

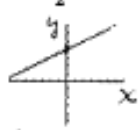
I)  $Y = X + 4$



J)  $Y = 3X + 4$



K)  $Y = \frac{1}{2}X + 4$



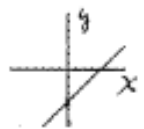
L)  $Y = -3X + 4$



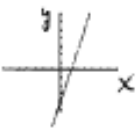
2a) What do the above equations have in common? \_\_\_\_\_

b) What do the above graphs have in common? \_\_\_\_\_

M)  $Y = X - 4$



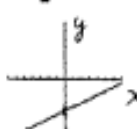
N)  $Y = 3X - 4$



O)  $Y = 5X - 4$



P)  $Y = \frac{1}{2}X - 4$



3a) What do the above equations have in common? \_\_\_\_\_

b) What do the above graphs have in common? \_\_\_\_\_

4. Find the the Y-intercept:

- |                          |                           |
|--------------------------|---------------------------|
| A) $y = 7x + 2$ _____    | G) $y = -x - 12$ _____    |
| B) $y = -7x + 2$ _____   | H) $y = -3x + 3/2$ _____  |
| C) $y = -5x + 6$ _____   | I) $y = 3/2x - 5/2$ _____ |
| D) $y = 8x - 7$ _____    | J) $y = 7 + 3x$ _____     |
| E) $y = 8x + 1$ _____    | K) $y = -7 + 3x$ _____    |
| F) $y = -8x + 156$ _____ | L) $y = 3x$ _____         |
- M) GENERALIZATION: For  $Y = mX + b$ , the Y-intercept is \_\_\_\_\_

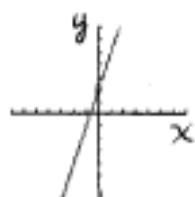
5. VERBALIZATION:

Graphically, the Y-intercept is where the graph crosses the \_\_\_\_\_. It can be found by letting the value of \_\_\_\_\_ equal \_\_\_\_\_. In a linear equation it is the \_\_\_\_\_ term.

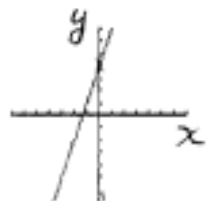
### SLOPE

Look at each of the following equations and their graphs:

A)  $Y = 3X + 2$



B)  $Y = 3X + 4$



C)  $Y = 3X - 2$



D)  $Y = 3X - 4$

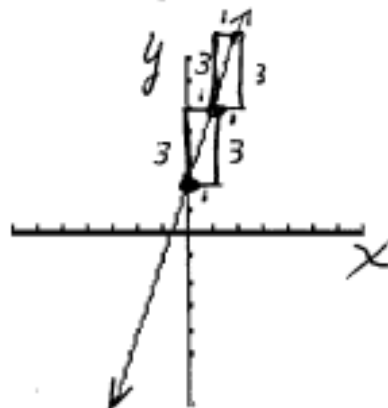


6. What do the above equations have in common? \_\_\_\_\_

What do the above graphs have in common? \_\_\_\_\_

You should have noticed that in the four equations above, in each equation, the coefficient of X was 3. As for the graphs, you should have noticed that they are parallel. Lines that are parallel have the same "steepness" or slope.

There is a way of describing the "steepness" or "slope" of a line. Consider the graph of  $Y = 3X + 2$ . First, notice that the Y-intercept is 2. Beginning at the Y-intercept (0,2), move one unit right, then up 3 units. You are now at the point (1,5). Now, from (1,5) move another unit right and up 3 more units. You are now at (2,8).



Since for each horizontal unit, you moved vertically 3 units, we say this line has a slope of 3/1 or 3. **Slope then is defined as the vertical distance divided by the horizontal distance.**

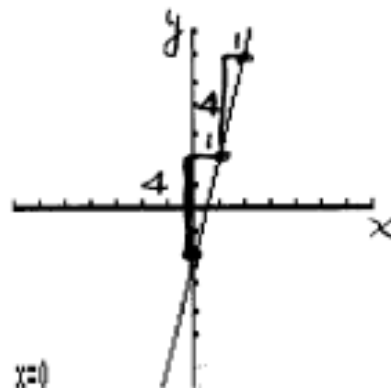
$$\text{SLOPE} = \frac{\text{VERTICAL}}{\text{HORIZONTAL}} \text{ or } \frac{\text{RISE}}{\text{RUN}} \text{ or } \frac{\text{Y distance}}{\text{X distance}}$$

Returning to the previous equation  $Y = 3X + 2$ , notice that the slope of the graph was 3. Also, the coefficient of X is 3.

Consider  $Y = 4X - 2$ . Beginning at the **Y-intercept** at  $(0,-2)$ , move 1 unit right and up 4 to  $(1,2)$ . Next move from  $(1,2)$  another unit to the right, then move 4 more units to  $(2,6)$ . Do you see that the slope

is  $\frac{\text{rise}}{\text{run}} = \frac{4}{1}$  or 4? Do you see that the equation  $Y = 4X - 2$  has

**X-coefficient 4?** When the equation is written  $Y = \underline{\quad}X + \underline{\quad}$ , the **coefficient of X is the slope.**



7. Give the slope of each of the following lines:

- |                           |       |                                      |       |
|---------------------------|-------|--------------------------------------|-------|
| A) $Y = 5X + 2$           | _____ | I) $Y = 3 - X$                       | _____ |
| B) $Y = 2 + 5X$           | _____ | J) $Y = \frac{3}{2}X + 5$            | _____ |
| C) $Y = -5X$              | _____ | K) $Y = -\frac{2}{3}X$               | _____ |
| D) $Y = -3X + 5$          | _____ | L) $Y = \frac{4}{5}X - 7$            | _____ |
| E) $Y = 3 - 2X$           | _____ | M) $Y = \frac{1}{2} - \frac{10}{3}X$ | _____ |
| F) $Y = X + \frac{5}{2}$  | _____ | N) $Y = 0 \cdot X + 3$               | _____ |
| G) $Y = 5 + X$            | _____ | O) $Y = 3$                           | _____ |
| H) $Y = -X - \frac{3}{2}$ | _____ | P) $Y = mX + b$                      | _____ |

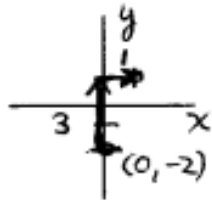
If the equation is written  $Y = mX + b$ , **m** represents the **slope**, and **b** represents the **Y-intercept**. This gives a fast way to graph a line if it is given in this form. The exercises on the next pages will help you understand.

Graph each of the following by locating the Y-intercept. From this point measure the slope (rise over run) and plot the next point.

8.  $Y = 3X - 2$

Y-int = -2

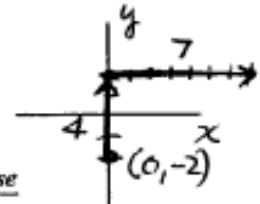
Slope  $m = \frac{3}{1} = \frac{\text{rise}}{\text{run}}$



9.  $Y = \frac{4}{7}X - 2$

Y-int = -2

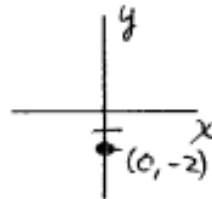
Slope  $m = \frac{4}{7} = \frac{\text{rise}}{\text{run}}$



10.  $Y = \frac{2}{3}X - 2$

Y-int = \_\_\_\_\_

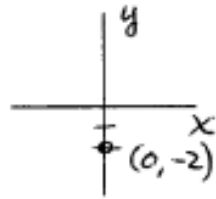
Slope = \_\_\_\_\_



11.  $Y = \frac{4}{1}X - 2$

Y-int = \_\_\_\_\_

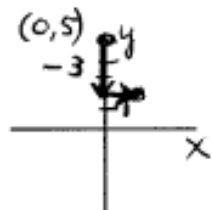
Slope = \_\_\_\_\_



12.  $Y = \frac{-3}{1}X + 5$

Y-int = \_\_\_\_\_

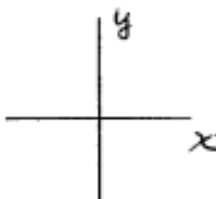
Slope = \_\_\_\_\_



13.  $Y = \frac{-3}{5}X + 4$

Y-int = \_\_\_\_\_

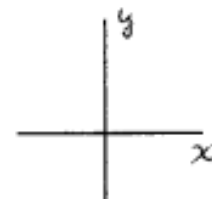
Slope = \_\_\_\_\_



14.  $Y = 1X + 5$

Y-int = \_\_\_\_\_

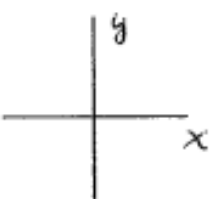
Slope = \_\_\_\_\_



15.  $Y = -X + 3$

Y-int = \_\_\_\_\_

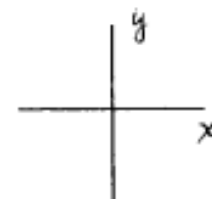
Slope = \_\_\_\_\_



16.  $Y = 5 - \frac{2}{3}X$

Y-int = \_\_\_\_\_

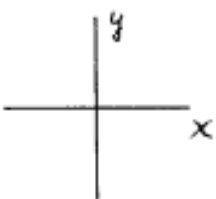
Slope = \_\_\_\_\_



17.  $Y = 4 + 3X$

Y-int = \_\_\_\_\_

Slope = \_\_\_\_\_



18.  $Y = -2X + 3$



19.  $Y = 5X - 2$



20.  $Y = \frac{2}{3}X - 4$



21.  $Y = -\frac{2}{3}X + 6$



22.  $Y = X - 4$



23.  $Y = 4 - X$



24.  $Y = 3 - \frac{1}{2}X$



25.  $Y = \frac{5}{2}X - 4$



26.  $Y = \frac{3}{4}X + 2$



27.  $Y = -\frac{3}{4}X - 2$



28.  $Y = 5 - \frac{2}{3}X$



29.  $Y = 4 + 3X$



Notice that each of the equations on the previous pages was given in the form  $Y = mX + b$  (**slope-intercept form**). However, equations are frequently given in another form called **standard form** in which the **X** and **Y terms** are on the same side of the equation:  $AX + BY = C$ . The tradition is to make A, B, and C integers, and the value of A positive. If the equation is given in **standard form**, the way to find the **slope** is to **solve for Y in terms of X**.

**EXAMPLE.** Find the slope and Y-intercept of  $3X + Y = 6$ .

<b>Solution:</b>	Given	$3X + Y = 6$
	Add $-3X$ to both sides:	$\begin{array}{r} 3X + Y = 6 \\ -3X \quad -3X \\ \hline Y = -3X + 6 \end{array}$

**Y-intercept is 6 and slope is -3.**

**In 30-38, solve for Y in terms of X. Give Y-intercept and slope.**

30.  $4X + Y = 8$

31.  $-4X + Y = 8$

32.  $Y - 3X = -4$

33.  $2X + 3Y = 12$

34.  $-2X + 3Y = 12$

35.  $3X + 2Y = 8$

$$\begin{array}{r} 2X + 3Y = 12 \\ -2X \quad -2X \\ \hline 3Y = -2X + 12 \end{array}$$

$Y =$

**Y-Int=**      **m=**     

36.  $X - 2Y = 6$

37.  $3X - 2Y = 6$

38.  $5X - 3Y = -6$

$$-2Y = -X + 6$$

$Y =$

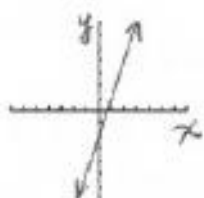
**Y-Int=**      **m=**

## ANSWERS 4.02

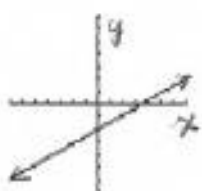
p.313-318:

- 1a) "Y= +2", b) Yint=2; 2a) "Y= +4", b) Yint=4; 3a) "Y= -4", b) Yint=-4;  
 4A) 2, B) 2, C) 6, D) -7, E) 1, 4F) 156, G) -12, H) 3/2, I) -5/2, J) 7, K) -7, L) 0, M) b;  
 5A) Y-axis, B) X, C) 0, D) constant or number term;  
 6A) "Y=3X ..." B) Same slope (steepness);  
 7A) 5, B) 5, C) -5, 7D) -3, E) -2, F) 1, G) 1, H) -1, I) -1, J) 3/2, K) -2/3, 7L) 4/5,  
 7M) -10/3, N) 0, O) 0, P) m;

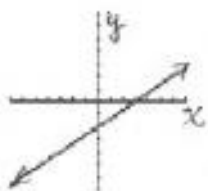
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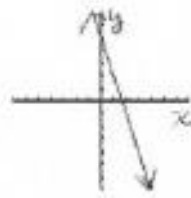
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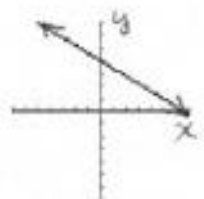
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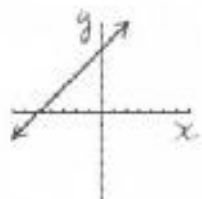
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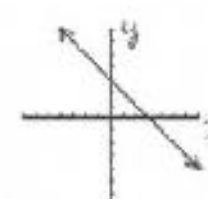
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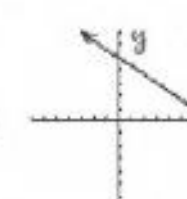
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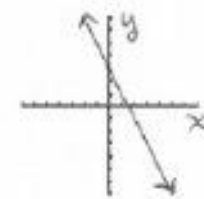
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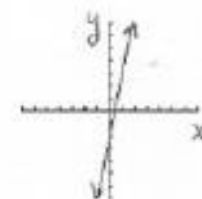
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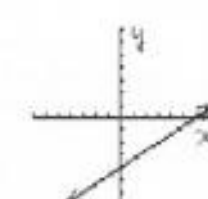
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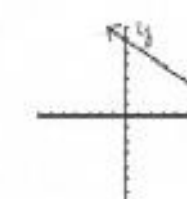
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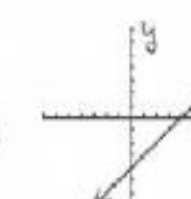
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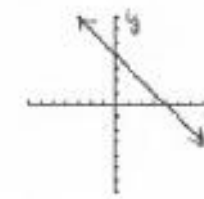
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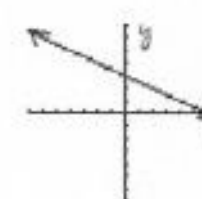
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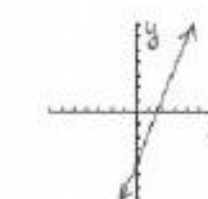
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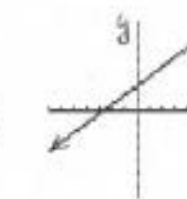
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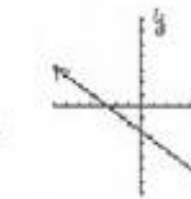
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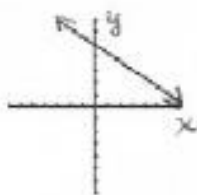
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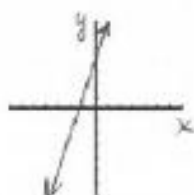
27.



28.



29.



30.  $y\text{-int} = 8$   
 $m = -4$

31.  $y\text{-int} = 8$   
 $m = 4$

32.  $y\text{-int} = -4$   
 $m = 3$

33.  $y\text{-int} = 4$   
 $m = -2/3$

34.  $y\text{-int} = 4$   
 $m = 2/3$

35.  $y\text{-int} = 4$   
 $m = -3/2$

36.  $y\text{-int} = -3$   
 $m = 1/2$

37.  $y\text{-int} = -3$   
 $m = 3/2$

38.  $y\text{-int} = 2$   
 $m = 5/3$

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