2.01 *Linear Graphs, Slope Distance Formula*

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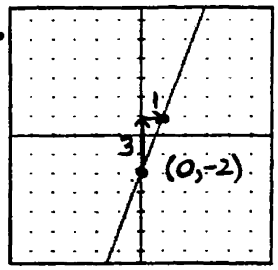
ANSWERS TO ALL EXERCISES ARE INCLUDED AT THE END OF THIS PAGE

You have learned that the equation **Y = mX + b** represents a straight line with **slope m** and **y-intercept b**. You also know that the equation of a straight line is frequently given in **standard form, AX + BY = C** where A, B, and C are integers and A>0. When an equation is given in **slope-intercept form, Y = mX + b**, the easiest way to graph it is to begin at the y-intercept and mark off the slope (rise up or down, run left or right) to obtain the next point as illustrated: **EXAMPLE 1. Y = 3X - 2** and **EXAMPLE 2. $Y = -\frac{2}{3}X + 4$.**

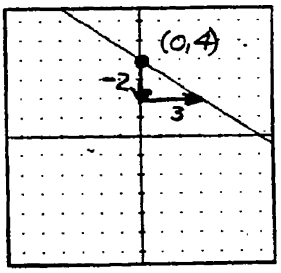
[In #1, the Y-intercept is -2, and slope is $\frac{3}{1}$ (rise 3, run 1).

In #2, the Y-intercept is 4, and slope is $-\frac{2}{3}$ (rise -2, run 3).]

1.

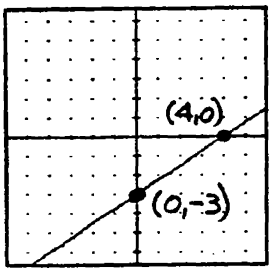


2.



When the equation is given in **standard form, AX + BY = C**, the easiest way to graph it is usually to find the **X** and **Y intercepts** (let X=0 and solve for Y, then let Y=0 and solve for X) as illustrated: **EXAMPLE 3. 3X - 4Y = 12; EXAMPLE 4. 5X + 3Y = -10.**

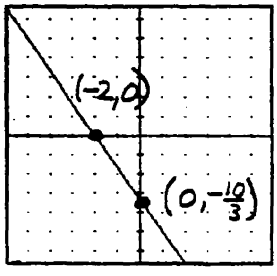
3.



X	Y
0	-3
4	0

X	Y
0	$-\frac{10}{3}$
-2	0

4.



To find the slope of an equation that is given in standard form, it is best to solve the equation for y and write the equation in slope-intercept form: **3X - 4Y = 12** **and** **5X + 3Y = -10.**

$$-4Y = -3X + 12 \qquad 3Y = -5X - 10$$

$$Y = \frac{3}{4}X - 3 \qquad Y = -\frac{5}{3}X - \frac{10}{3}$$

Therefore, the slopes are: $m = \frac{3}{4}$ $m = -\frac{5}{3}$.

To find the **slope between two points,** remember the formula:

$$m = \frac{Y_2 - Y_1}{X_2 - X_1}$$

To find the **distance between two points,** use the **distance formula:**

$$d = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$$

To find the **midpoint of a line segment,** (it's as easy as averaging two test grades together--just add the numbers together and divide by 2), the **midpoint formula** is:

$$\left(\frac{X_1 + X_2}{2}, \frac{Y_1 + Y_2}{2}\right)$$

To find the **equation of a line,** remember you need one point on the line, the slope of the line, and the equation known as the **slope-intercept form:**

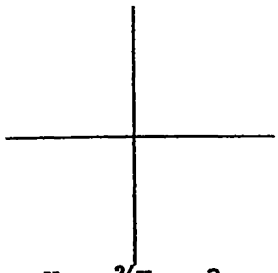
$$Y = mX + b$$

Finally, remember that if two lines are **parallel,** they have the **same slope.** If two lines are **perpendicular,** the slope of one is the **negative reciprocal** of the other.

In #1-9, sketch graphs for each of the equations. Find the slope of each line:

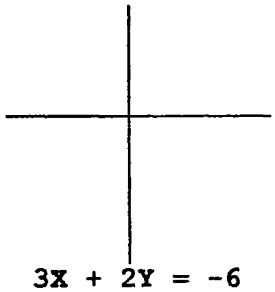
1. $Y = 2X + 3$

m=____; Y-int=____

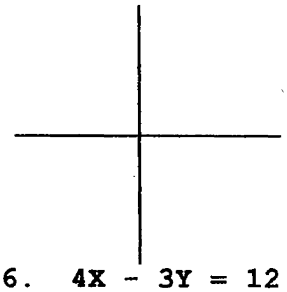


2. $Y = -3X + 6$

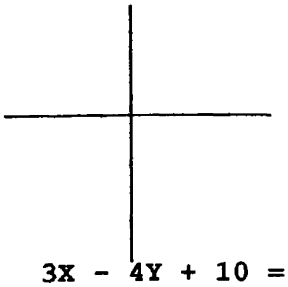
m=____; Y-int=____



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

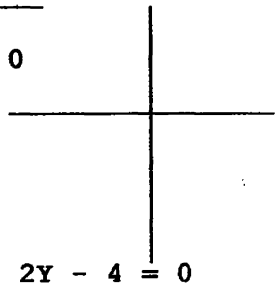


4. $Y = \frac{2}{3}X - 3$



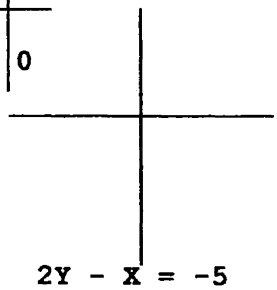
5. $3X + 2Y = -6$

X	Y
0	
	0

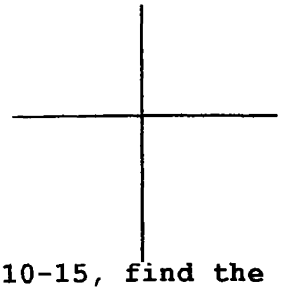


6. $4X - 3Y = 12$

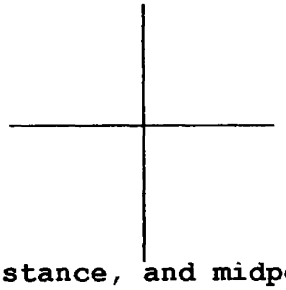
X	Y
0	
	0



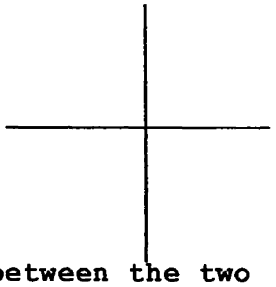
7. $3X - 4Y + 10 = 0$



8. $2Y - 4 = 0$



9. $2Y - X = -5$



In #10-15, find the slope, distance, and midpoint between the two given points.

10. (4, 7); (6, 3)

$m = \frac{3 - 7}{6 - 4} =$

$d = \sqrt{(6-4)^2 + (3-7)^2}$

=

mid= $(\frac{4+6}{2}, \frac{7+3}{2})$

=

11. (3, 7); (1, -1)

12. (-4, 2); (-10, -6)

13. **(-4, 7); (-8, 2)** **14.** **(3, 7); (8, -5)** **15.** **(-8, -2); (-2, 6)**

In 16-23, find the equation in slope intercept form, $y = mx + b$, of the line:

16. with slope -5 through (-4,3)

$y = mx + b$
$3 = -5(-4) + b$
$-17 = b$
$y = -5x - 17$

17. with slope $\frac{5}{8}$ through (3,-6)

18. through (-2,5) and (-8,9)

$m =$

19. through (6,-2) and (-2,8)

20. through (-3,5) and parallel to $Y = -7X - 1$.

$m =$ $m_{parallel} =$

21. through (4,-5) and parallel to $Y = \frac{3}{4}X + 2$.

22. through (-3,5) and perpendicular to $Y = -7X - 1$.

$m =$ $m_{\perp} =$

23. through (4,-5) and perpendicular to $Y = \frac{3}{4}X + 2$.

24. through (-3,5) and perpendicular to **$7X - 4Y = 1$.**

25. through (4,-5) and perpendicular to **$3X + 5Y = -15$.**

In 26-31, find the perpendicular bisector of the line segment between the two given points. [Note: the perpendicular bisector of a line segment is a line that is perpendicular to the line segment and that passes through the midpoint of the line segment. You must first find the midpoint and slope of the line segment. Then use the midpoint and the negative reciprocal of the slope in the point-slope formula to find the equation of the line.]

26. **(-2,3); (4,7)**

mid= $\left(\frac{-2+4}{2}, \frac{3+7}{2}\right) =$

$m = \frac{7 - 3}{4 + 2} =$, $m_{\perp} =$

27. **(3,-6); (-5,4)**

28. **(-4,-2); (-12,8)**

29. **(-4,0); (4,-6)**

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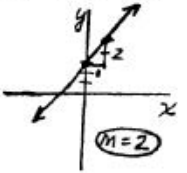
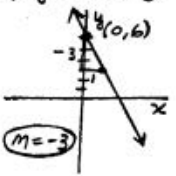
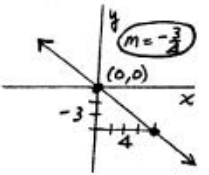
1. $y = 2x + 3$



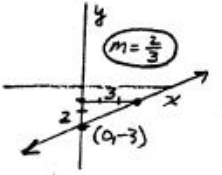
2. $y = -3x + 6$



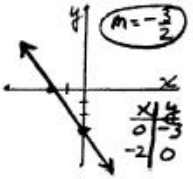
3. $y = -\frac{3}{4}x$



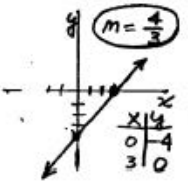
4. $y = \frac{2}{3}x - 3$



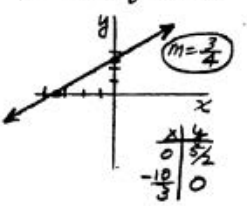
5. $3x + 2y = -6$



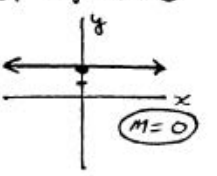
6. $4x - 3y = 12$



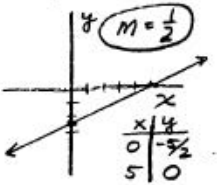
7. $3x - 4y + 10 = 0$



8. $2y - 4 = 0$



9. $2y - x = -5$



10. $m = -2$
$d = 2\sqrt{5}$
mid $(5, 5)$

11. $m = 4$
$d = 2\sqrt{17}$
mid $(2, 3)$

12. $m = \frac{4}{3}$
$d = 10$
mid $(-7, -2)$

13. $m = \frac{5}{4}$
$d = \sqrt{41}$
mid $(-6, \frac{9}{2})$

14. $m = -\frac{12}{5}$
$d = 13$
mid $(\frac{11}{2}, 1)$

15. $m = \frac{1}{3}$
$d = 10$
mid $(-5, 2)$

16. $y = -5x - 17$

17. $y = \frac{5}{8}x - \frac{63}{8}$

18. $y = -\frac{2}{3}x + \frac{11}{3}$

19. $y = -\frac{5}{4}x + \frac{11}{2}$

20. $y = -7x - 16$

21. $y = \frac{3}{4}x - 8$

22. $y = \frac{1}{7}x + \frac{38}{7}$

23. $y = -\frac{4}{3}x + \frac{1}{3}$

24. $y = -\frac{4}{7}x + \frac{23}{7}$

25. $y = \frac{5}{3}x - \frac{35}{3}$

26. $y = -\frac{3}{2}x + \frac{13}{2}$

27. $y = \frac{4}{5}x - \frac{1}{5}$

28. $y = \frac{4}{9}x + \frac{47}{5}$

29. $y = \frac{4}{3}x - 3$

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