*recall (x, y) $m = \frac{y_2 - y_1}{x_2 - x_1}$

Find the slope of the line passing through the points:

80. (2,1) and (6,6)

$m = \frac{6-1}{6-2} = \boxed{\frac{5}{4}}$

81. (−5,2) and (4,2)

$m = \frac{2-2}{4-(-5)} = \frac{2-2}{4+5} = \frac{0}{9}$

$\boxed{\therefore m = 0}$

82. (−3,0) and (3,−4)

$m = \frac{-4-0}{3-(-3)} = \frac{-4-0}{3+3} = \frac{-4}{6}$

always simplify

$\boxed{\therefore m = -\frac{2}{3}}$

83. The slope of a line is -2. The line passes through (0,0) and (-3,y). Find the value of y.

$m = -2$

$\frac{-2}{1} = \frac{y-0}{-3-0}$ ① Substitute

$\frac{-2}{1} = \frac{y}{-3}$ ② Crossmultiply

$-2 \times -3 = y \times 1$ ③ Solve

$\boxed{6 = y}$

84. A line has a slope of 1.5. It passes through (-2,1) and (x,7). Find the value of x.

$m = 1.5 = \frac{3}{2}$

$\frac{3}{2} = \frac{7-1}{x-(-2)}$ ① Sub.

$\frac{3}{2} = \frac{6}{x+2}$ ② Cross Multiply

$3(x+2) = 6 \times 2$

$3x + 6 = 12$

$-6 \quad -6$

$\therefore 3x = 6$

$\div 3 \quad \div 3$

$\boxed{x = 2}$

85. **Challenge#5:** Show that (7, -1) is on the line $y = 2x - 15$

Algebraically:

substitute $(7,-1)$ (x, y)

$y = 2x - 15$

$-1 = 2(7) - 15$

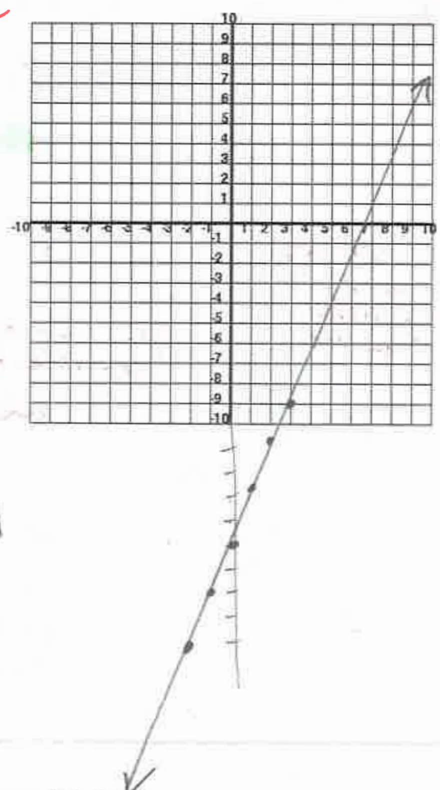
$-1 = 14 - 15$

$-1 = -1$ ← check if these (x,y) points satisfy the equation.

Yes!

$\boxed{\therefore (7,-1) \text{ is on the line } y = 2x - 15.}$

Graphically:



$y = 2x - 15$ ↑ y-int.

x	y	
-2	-19	$= 2(-2) - 15 = -19$
-1	-17	$2(-1) - 15 = -17$
0	-15	
1	-13	
2	-11	
3	-9	

* create a table of values to graph the equation

The Equation of a Line

As you have seen, equations such as $2x + 3y = 12$ or $3y = x + 9$ or $y = \frac{5}{6}x - 4$ produce straight lines when graphed. They are **linear equations**.

Linear Equations may be written in several forms: slope y-intercept

shows slope(m) and x,y coordinates

Slope-Intercept Form:	$y = mx + b$	$y = 3x + 2$
Point-Slope Form:	$y_2 - y_1 = m(x_2 - x_1)$	$(y - 2) = 3(x - 0)$
General Form:	$Ax + By + C = 0$	$3x - y + 2 = 0$

Recall the ***Equation of a Line Property:***

"The coordinates of every point on the line will satisfy the equation of the line."

it said this!

class example.

Eg.1. Show that (7, -1) is on the line $y = 2x - 15$

$y = 2x - 15$	If (7, -1) is on the line, it will satisfy the equation.
$(-1) = 2(7) - 15$	Substitue the ordered pair into the equation.
$-1 = 14 - 15$	Does the left side = right side?
$-1 = -1$	Yes. The point IS on the line.

2 ways to solve:
① Graphically - create a table of values
② Algebraically - use substitution + check.

Do you recall the "text box" like this on page 10?

Determine if the following points lie on the line $y = 2x + 4$ (HINT: substitution!)

86. (-10, 24)

$y = 2(x) + 4$
$24 = 2(-10) + 4$
$24 = -20 + 4$
$24 \neq -16$

no, (-10, 24) is not on the line $y = 2x + 4$

87. (5,14)

$14 = 2(5) + 4$
$14 = 10 + 4$
$14 = 14$

yes, (5,14) is on the line.

88. (-7,-10)

$-10 = 2(-7) + 4$
$-10 = -14 + 4$
$-10 = -10$

yes, (-7,-10) is on the line.

Determine if the following points lie on the line $3x - 2y + 6 = 0$

89. (10, 18)

$3x - 2y + 6 = 0$
$3(10) - 2(18) + 6 = 0$
$30 - 36 + 6 = 0$
$0 = 0$

yes, (10,18) is on the line.

90. (0,-3)

$3(0) - 2(-3) + 6 = 0$
$0 - (-6) + 6 = 0$
$12 \neq 0$

No, not on the line.

91. (-6,-6)

$3(-6) - 2(-6) + 6 = 0$
$-18 - (-12) + 6 = 0$
$-18 + 12 + 6 = 0$
$0 = 0$

yes, on the line.

92. Determine if the point $(2, -3)$ is on the line $y = 3x - 9$.

$-3 = 3(2) - 9$

$-3 = 6 - 9$

$-3 = -3$

Explain why or why not:

Yes, it is on the line because when the coordinates 2, -3 are substituted into the equation, left side and right side are equal.

93. Determine if the point $(-1, -4)$ is on the line $3x - 2y - 11 = 0$.

(x, y)

$3(-1) - 2(-4) - 11 = 0$

$-3 + 8 - 11 = 0$

$-6 = 0$

$\therefore -6 \neq 0$

Explain why or why not:

No, the coordinates -1, -4 are not on the line $3x - 2y = 0$ because when substituted $-6 \neq 0$, ie: sides are not equal.

94. Determine if the point $(2, -3)$ is on the line $y + 1 = \frac{3x}{2}$.

$(-3) + 1 = \frac{3(2)}{2}$

$-2 = \frac{6}{2}$ $\quad -2 \neq 3.$

Explain why or why not:

No, $(2, -3)$ is not on the line $y + 1 = \frac{3x}{2}$ because $-2 \neq 3$.

95. Determine if the set of ordered pairs represents a linear relation.

x, y

(2,3), (3,4), (4,5), (5,6)

x	y
2	3
3	4
4	5
5	6

+1 +1

Explain why or why not:

yes, it is a linear relation because the rate of change (slope) is constant (inc. by +1).

96. Determine if the set of ordered pairs represents a linear relation.

Explain why or why not:

x	y
1	1
1	2
1	3
1	4

(1,1), (1,2), (1,3), (1,4)

all x values are equal, while y changes. This represents a vertical line!

97. Determine if the set of ordered pairs represents a linear relation.

(2,1), (3,0), (4, −1), (5, −2)

Explain why or why not:

x	y
2	1
3	0
4	-1
5	-2

inc +1

-1

yes, there is a constant rate of change. (ie: as x ↑ +1, y ↓ -1) you can choose ANY values... make math easy on yourself and select values which will elimate fractions! whole numbers make for easier graphing.

$y = mx + b$

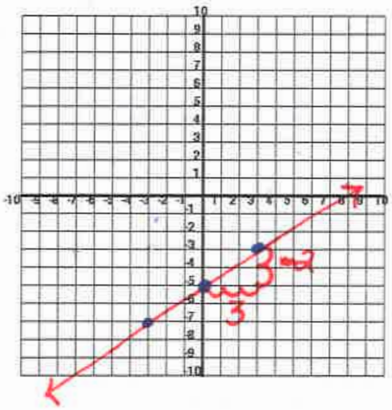
b: y-int (when $x=0$)

Equation of a Line: Slope-Intercept Form

98. Graph the line $y = \frac{2}{3}x - 5$ using a table of values.

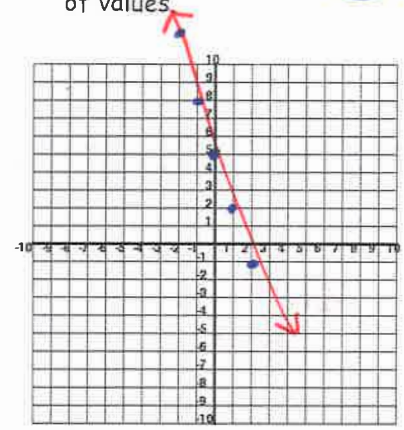
(x,y) $(0,-5)$

x	y
-3	$\frac{2}{3}(-3)-5 = -7$
0	-5
3	$\frac{2}{3}(3)-5 = -3$



99. Graph the line $y = -3x + 5$ using a table of values.

x	y
-2	$-3(-2)+5 = 11$
-1	$-3(-1)+5 = 8$
0	5
1	$-3(1)+5 = 2$
2	$-3(2)+5 = -1$



100. What is the slope of the line above?

$m = \frac{2}{3}$ (note + slope "uphill")

101. What is the slope of the line above?

$m = -3$ (note neg. slope) "downhill"

102. What is the y-intercept of the line above?

$y = mx + b = \frac{2}{3}x \boxed{-5}$ y-int $= -5$

103. What is the y-intercept of the line above?

$= 5$ (where $x = 0$)

104. Compare these values to the equation. What do you notice?

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

m: slope, b: y-int.

105. Compare these values to the equation. What do you notice?

$y = mx + b$ or $y = -3x + 5$

-3: slope, $+5$: y-int.

We say the equations above are written in ***slope-intercept form***. A general formula for an equation in slope intercept form is $y = mx + b$

The slope is the coefficient of x.

The y-intercept. (Make note of the sign) ±

Remember, x and y are the coordinates of ANY point on the line. When substituted, they will satisfy the equation. See your work on the previous page!

ie: you can choose ANY numbers for your table of values. $\{-2, -1, 0, 1, 2\}$ are just a suggestion.

State the slope and y-intercept for the line represented by each equation.

106. $y = -3x \boxed{+2}$

slope y-int

$m = -3$

$y\text{int} = 2$

107. $y = -\frac{3}{5}x - 7$

$m = -3/5$

$y\text{-int} = -7$

108. $y = \frac{9}{2}x - \frac{3}{2}$

$m = 9/2$

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

Write the equation of each line given the slope and y-intercept.

109. $m = 2$, $b = -5$

$y = mx + b$

$y = 2x - 5$ *note ± sign.

110. $m = \frac{7}{3}$, $b = \frac{2}{3}$

$y = \frac{7}{3}x + 2/3$

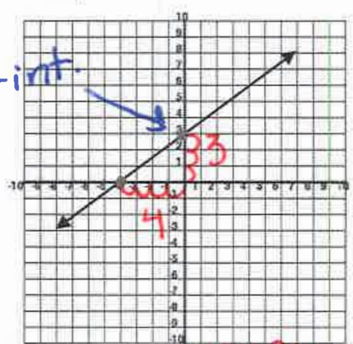
111. $m = -3$, $b = -2$

$y = -3x - 2$

For each line below, state the slope, y-intercept, and equation.

112.

y-int.



"uphill" = ⊕ slope

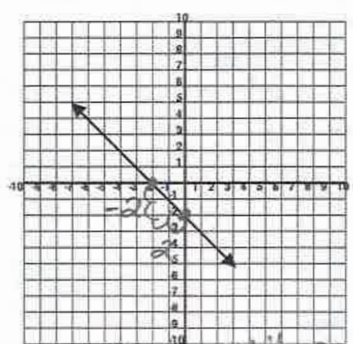
slope $\frac{\text{rise}}{\text{run}} = 3/4$

y-intercept 3

equation:

$y = 3/4x + 3$

113.



"downhill" = ⊖ neg

slope $-2/2 = -1$

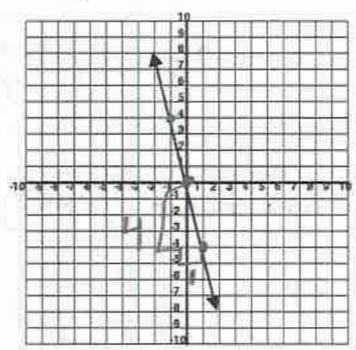
y-intercept -2

equation:

$y = -1x - 2$

$\therefore y = -x - 2$

114.



slope $-4/1 = -4$

y-intercept 0

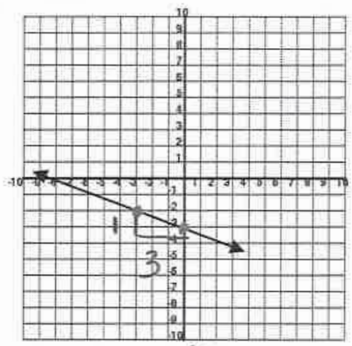
equation:

$y = -4x + 0$

$\therefore y = -4x$

For each line below, state the slope, y-intercept, and equation.

115.

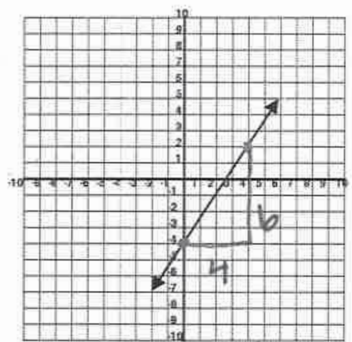


slope $-1/3$

y-intercept -3

equation: $y = -1/3x - 3$

116.

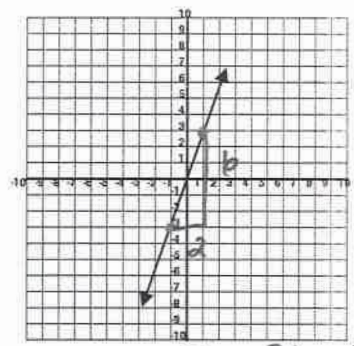


slope $6/4 = 3/2$

y-intercept -4

equation: $y = 3/2x - 4$

117.



slope $6/2 = 3/1 = 3$

y-intercept 0

equation: $y = 3x$

118. What do you notice about the equation of the lines passing through the origin?

There is no constant term (y-int)

∴ $y = mx$

119. When is *b* positive?

when the line crosses the y-axis above the x-axis.

120. When is *b* negative?

when the line crosses the y-axis below the x-axis

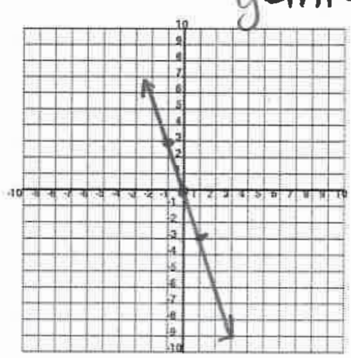
Graph the equations below by finding the slope and y-intercept from the equation.

121.

$y = -3x$

$m = \frac{-3}{1}$

y-int = 0

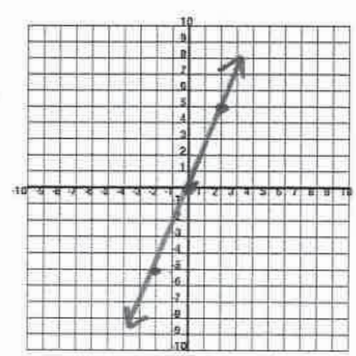


122.

$y = \frac{5}{2}x$

$m = 5/2$

y-int = 0



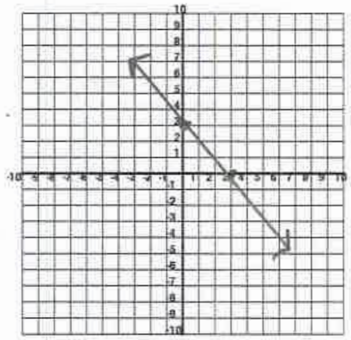
Graph the equations below by finding the slope and y-intercept from the equation.

123.

$y = -x + 3$

$m = -1$

$y\text{-int} = 3$

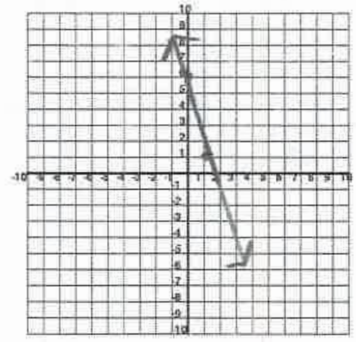


124.

$\frac{\cancel{2}y}{\cancel{2}} = \frac{-10x + 12}{2}$ $y = -5 + 6$

$m = -5$

$y\text{int} = 6$

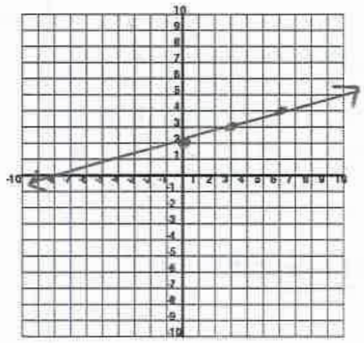


125.

$y - \cancel{5} = \frac{1}{3}x - 3$ $+5$
$+\cancel{5}$ $y = \frac{1}{3}x + 2$

$m = \frac{1}{3}$

$y\text{int} = 2$



126.

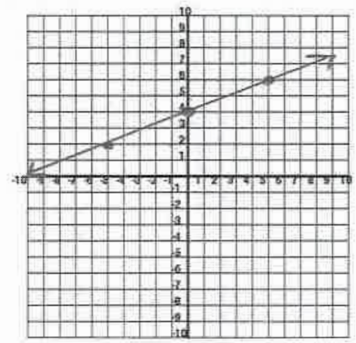
$2x - 5\cancel{y} + 20 = 0$
$+5y$ $+5y$

$\frac{2x + 20}{5} = \frac{\cancel{5}y}{\cancel{5}}$

$\frac{2}{5}x + 4 = y$

$m = \frac{2}{5}$

$y\text{int} = 4$



127.

$12\left(\frac{x}{3} - \frac{y}{4} = 1\right)$

$\frac{12x}{3} - \frac{12y}{4} = 12$

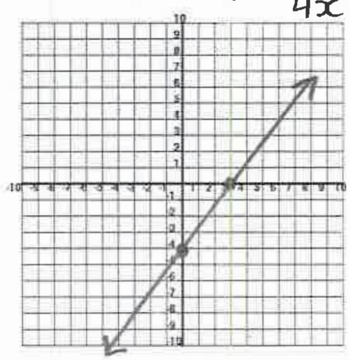
$4x - 3y = 12$

$\frac{4x - 12}{3} = \frac{\cancel{3}y}{\cancel{3}}$

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

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

$y\text{int} = -4$



128.

$(12 \times 2) \div 3 = 8$

$(12 \times 3) \div 4 = 9$

$12\left(\frac{2x}{3} + \frac{3y}{4} = -6\right)$

$8x + 9y = -72$

$\frac{\cancel{9}y}{\cancel{9}} = \frac{-8x - 72}{9}$

$y = \frac{-8}{9}x - 8$

$x = \frac{-8}{9}$

$y\text{int} = -8$