3.6 and 3.7 Lines in the Coordinate Plane and ∥ and ⊥ lines

① $y = mx + b$ (Slope intercept form)

m = slope, b = y-intercept

② $Ax + By = C$ (standard form)

A = positive

no fractions, C = #

③ $\frac{y_2 - y_1}{x_2 - x_1} = m$ (slope) $m = \frac{\text{rise}}{\text{run}}$

④ $y - y_1 = m(x - x_1)$ (point slope form)

m = slope; (x_1, y_1) = point

Ex. 1 $P(\overset{x_1}{2}, \overset{y_1}{3})$, slope = 2 Find the equation of the line

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

$y - 3 = 2x - 4$

$y = 2x - 1$

$y = mx + b$

$3 = 2(2) + b$

$3 = 4 + b$

$-1 = b$

$y = 2x - 1$

Ex. $y + 1 = 3(x - 4)$ Find the point and slope

$(4, -1)$; $m = 3$

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$x \quad y$

$(2,3) \quad m=2$

<u>Way 1</u>

$y=mx+b$

$3=2(2)+b$

$3=4+b$

$-1=b$

$y=2x-1$

slope intercept

<u>Way 2</u>

$x_1 \; y_1$

$(2,3) \quad m=2$

$y-y_1=m(x-x_1)$

$y-3=2(x-2)$ point-slope

$y-3=2x-4$

$y=2x-1$ slope-intercept

Ex. Find the point and the slope

$y+1=3(x-4)$ ← point slope

$m=3$

point $(4, -1)$

$m = +$; $m = -$

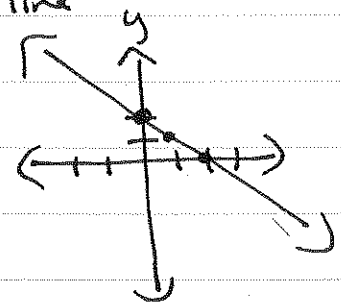
Ex. 3 $R(-3, 5)$; slope $= -1$ Find equation of line

$5 = -1(-3) + b$

$5 = 3 + b$

$2 = b \longrightarrow y = -1x + 2$

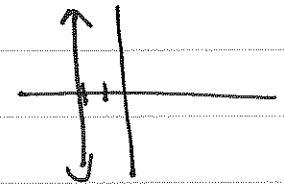
$m = \frac{-1}{1}$



Ex. 4 $x = -2$

If the equation of a line is $x = \#$, then the line is vertical

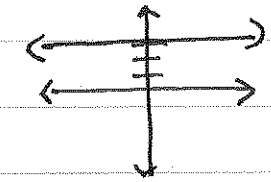
$m =$ undefined



Ex. 5 $y = 3$

If the equation of a line is $y = \#$, then the line is horizontal

$m = 0$



<u>// and ⊥ lines</u>

// lines never intersect; Ex. $m = \frac{1}{3}$, $m = \frac{1}{3}$

⊥ lines; Ex. $\frac{1}{3}$, -3 opposite reciprocal

Ex. $\frac{2}{3}$, $-\frac{3}{2}$

Ex. Find the equation of a line $\parallel$ to $y = -4x + 3$ that goes through $(1, -2)$

$m = -4$; $(1, -2)$

$y = mx + b$

$-2 = -4(1) + b$

$-2 = -4 + b$

$2 = b \longrightarrow y = -4x + 2$

Ex. Find the equation of a line $\perp$ to $y = -3x - 5$ that contains $(-3, 7)$

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

$m = \frac{1}{3}$; $(-3, 7)$

$7 = \frac{1}{3}(-3) + b$

$7 = -1 + b$

$8 = b \longrightarrow y = \frac{1}{3}x + 8$

Ex. $\overset{x_1\ y_1}{(2, 6)}$, $\overset{x_2\ y_2}{(-1, 3)}$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-6}{-1-2} = \frac{-3}{-3} = 1$$

$y = mx + b$

$6 = 1(2) + b$

$6 = 2 + b$

$4 = b \longrightarrow y = 1x + 4$

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Ex. $y = -4x + 3$; $(1, -2)$

// $m = -4$

$y = mx + b$

$-2 = -4(1) + b$

$-2 = -4 + b$

$2 = b$

$y = -4x + 2$ OR

$y + 2 = -4(x - 1)$

$y + 2 = -4x + 4$

$y = -4x + 2$

Ex. $y = -3x - 5$; $(-3, 7)$

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

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

$y - 7 = \frac{1}{3}(x + {}^{+}3)$

$y - 7 = \frac{1}{3}x + 1$

$y = \frac{1}{3}x + 8$

Ex. Find equation of line containing $(2, 6)$ and $(-1, 3)$

$x_1 \; y_1 \qquad x_2 \; y_2$