MATH 210 FINITE MATHEMATICS

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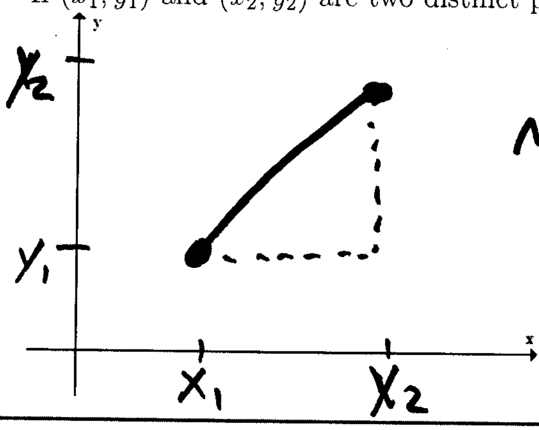
1.2 Lines and Slopes

Definition 1: Slope of a Line

If (x_1, y_1) and (x_2, y_2) are two distinct points, then the slope m is



$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Definition 2: Different Forms for a Line

Point-Slope Form NEED (1) POINT (2) SLOPE

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

Slope-Intercept Form NEED: (1) SLOPE

(2) y-INT $(0, b)$

$$y = mx + b$$

Example 1

Find the slope of the line that passes through the points $(-2, 2)$ and $(3, -1)$, the equation of the line, and then sketch. $x_1\ y_1 \quad x_2\ y_2$

SLOPE: $m = \dfrac{-1-2}{3-(-2)} = \dfrac{-3}{5}$

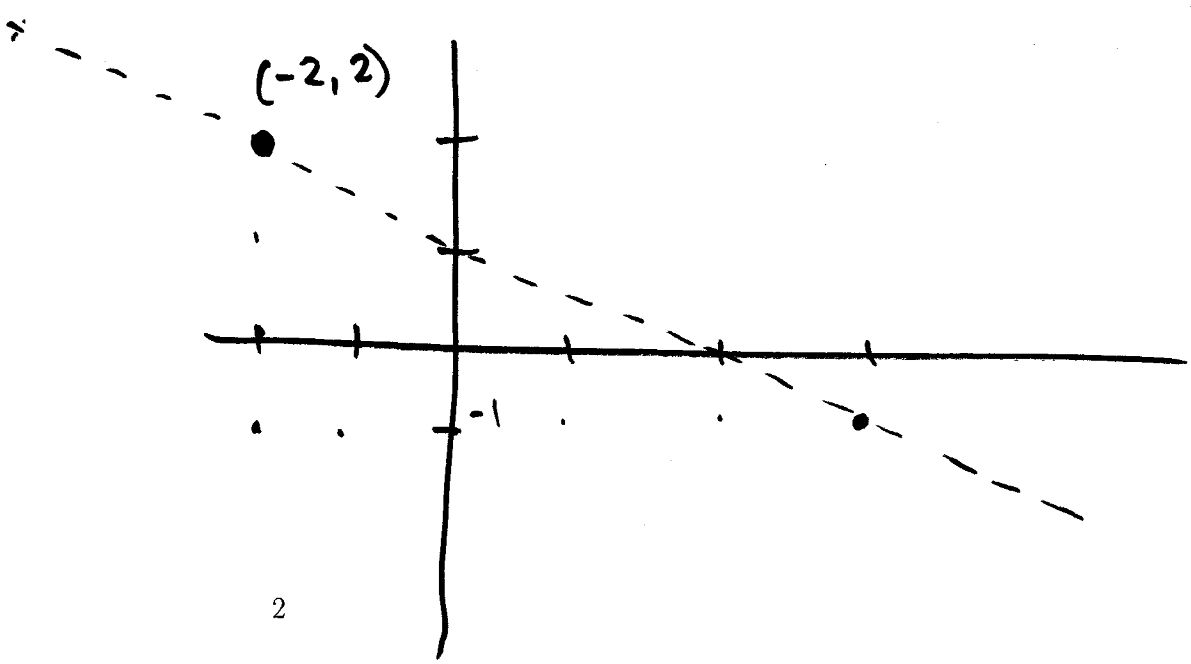
POINT-SLOPE: $y - y_1 = m(x - x_1)$

$\Rightarrow y - 2 = \dfrac{-3}{5}(x+2)$

$\Rightarrow y - 2 = \dfrac{-3}{5}x - \dfrac{6}{5}$

$\quad +2 \qquad\qquad +2$

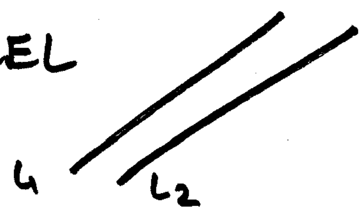
SLOPE-INTERCEPT $y = \dfrac{-3}{5}x + \dfrac{4}{5}$



Definition 3: Perpendicular and Parallel Lines

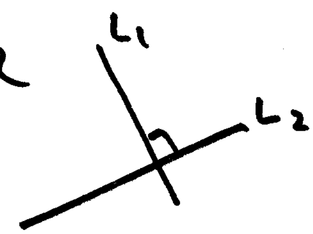
Suppose you have two lines L_1 and L_2 with slopes m_1 and m_2.

PARALLEL



$M_1 = M_2$

PERPENDICULAR



$M_1 = -\frac{1}{M_2}$

Example 2

Find an $\boxed{\text{equation}}$ of the line that passes through the point $(-1, 3)$ that is perpendicular to $y = -\frac{2}{3}x + 4$.

NEED (1) POINT (2) SLOPE

(1) POINT: $(-1, 3)$

(2) SLOPE: $M = \frac{3}{2}$

POINT-SLOPE

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

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

$$y = \frac{3}{2}x + \frac{9}{2}$$

Definition 4: General Equatio of a Line

$$Ax + By = C \qquad 2x-5y=-10$$

$$\text{OR} \quad \boxed{Ax+By+C=0} \qquad 2x-5y+10=0$$

Example 3

Consider the line $2x - 5y + 10 = 0$. $\longrightarrow$ $2x-5y=-10$

1. Find the slope

$$m = \frac{-A}{B} = \frac{-2}{-5} = \frac{2}{5}$$

$$-5y = -2x - 10$$

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

2. Find the x and y intercepts.

Y-INT: LET $x=0$ $\longrightarrow$ $2(0)-5y=-10$

$$\Rightarrow -5y=-10$$

$$y=2 \qquad \boxed{(0,2)}$$

X-INT: LET $y=0$ $\quad 2x-5(0)=-10$

$$2x=-10$$

$$x=-5 \qquad \boxed{(-5,0)}$$

$$2x-5y=-10$$

3. Sketch the line