Section P.3   Lines in the Plane

Objective:
Given a linear function students will be able to identify/find its slope, x and y intercept and sketch it graph. Given a line and a point students will be able to find the line parallel or perpendicular to the line.

Study Problems page 33

#5-13 odd, 25-37odd,43-47 odd, 65,66,96,99-101

Graphical Interpretation In Exercises 83–86, match the description with its graph. Also determine the slope and how it is interpreted in the situation. [The graphs are labeled (a), (h), (c), and (d).]

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(a) 25

(b) 125

(c) 25

(d) 600
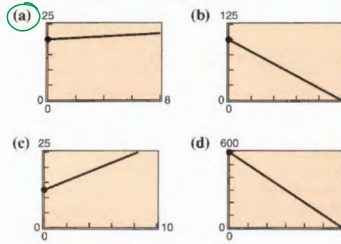
83. A person is paying $10 per week to a friend to repay a $100 loan. $m=10$ (b)
rep. the dec. of loan

84. An employee is paid $12.50 per hour plus $1.50 for each unit produced per hour.
rep. the cost per mile.

85. A sales representative receives $20 per day for food plus $0.25 for each mile traveled. (a)
$m=.25$

86. A word processor that was purchased for $600 depreciates $100 per year.

Example
Find the slope of the given points

a. (3,-5) and (-9, 13)

$$m = \frac{y-y}{x-x}$$

$$= \frac{13 + +5}{-9 - 3}$$

$$m = \frac{18}{-12}$$

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

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78. *Attic Height* The "rise to run" ratio of the roof of a house determines the steepness of the roof. Suppose the rise to run ratio of a roof is 3 to 4. Determine the maximum height in the attic of the house if the house is 32 feet wide.

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attic height

4
3

32

32 ft
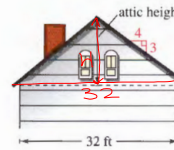
$$\frac{3}{4} = \frac{h}{16}$$

$$4h = 48$$

$$h = 12$$

max height of attic is 12 ft.

Example
Ⓐ *Write an equation of the line passing through (2, -3) and (3,5).* $x_1\ y_1$

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

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

$$y + 3 = 8(x-2)$$

$$y + 3 = 8x - 16$$

slope
inter. $$y = 8x - 19$$

G.F.
$$-8x + y + 19 = 0$$

Ⓑ

Summary of Equations of Lines

1. General form: $Ax + By + C = 0$
2. Vertical line: $x = a$
3. Horizontal line: $y = b$
4. Slope-intercept form: $y = mx + b$
5. Point-slope form: $y - y_1 = m(x - x_1)$

Example
Write a linear function that passes thru (-3, 5) and has a slope of -2.

$$y - 5 = -2(x+3)$$
$$y - 5 = -2x - 6$$
(SI) $\quad y = -2x - 1$
(GF) $\quad 2x + y + 1 = 0$

Example
Find the slope, x and y intercept of the linear equation

Ⓐ $2x-3y=5$ Ⓑ

$(0, \frac{-5}{3})$ y-int
$(\frac{5}{2}, 0)$ x-int
$-3y = -2x + 5$
$y = \frac{2}{3}x - \frac{5}{3}$

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

Example
Write a linear function that passes thru the points (5, 2) and is ***parallel*** to *x-5y=4*

$m = \frac{1}{5}$

$$y - 2 = \frac{1}{5}(x - 5)$$
$$y - 2 = \frac{1}{5}x - 1$$
$$y = \frac{1}{5}x + 1$$

What if it said perpendicular, how would you find the linear function?

Example
Find the equation of the line that passes thru the points (-1,3) and is ***perpendicular*** to *2x+3y=4*

$3y = -2x + 4$

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

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