September 20th, 2007

Parallel and Perpendicular Lines

// + ⊥

parallel → slopes → are same

perpendicular → slopes → ⊖ reciprocal

Ex 1: Give an equation // + ⊥ to $y = \frac{1}{2}x - 3$

// → $y = \frac{1}{2}x + 2$

⊥ → $y = -2x + 1$

Ex 2: Give an equation // + ⊥ to $2x - 3y + 1 = 0$

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

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

// → $y = \frac{2}{3}x + 2$

⊥ → $y = -\frac{3}{2}x + 1$

Ex 3: State whether the lines passing through each are //, ⊥ or neither.

a. (2, 2) (4, 4) (8, 8) (6, 6)

b. (1, 5) (5, 1) (2, 2) (1, 3)

c. (6, 7) (1, 2) (3, 4) (5, 6)

a. $m = \frac{4-2}{4-2} = \frac{2}{2} = 1$

$m = \frac{8-6}{8-6} = \frac{2}{2} = 1$

$\therefore$ //

b. $m = \frac{1-5}{5-1} = \frac{-4}{4} = -1$

$m = \frac{3-2}{1-2} = \frac{1}{-1} = -1$

$\therefore$ //

c. $m = \frac{7-2}{6-1} = \frac{5}{5} = 1$

$m = \frac{6-4}{5-3} = \frac{2}{2} = 1$

$\therefore$ //

Ex 4: Give an equation of a line:

(a) // to $y = 3x + 5$ & passing through $(2, 2)$

$y = 3(x-2)+2$
$y = 3x - 6 + 2$
$y = 3x - 4$

$m = 3$
$pt = (2, 2)$

(b) $\perp$ to $y = 3x + 5$ & passing through $(2, 2)$

$m = -\frac{1}{3}$
$pt = (2, 2)$

$y = -\frac{1}{3}(x-2)+2$
$y = -\frac{1}{3}x + \frac{2}{3} + 2$
$y = -\frac{1}{3}x + \frac{8}{3}$

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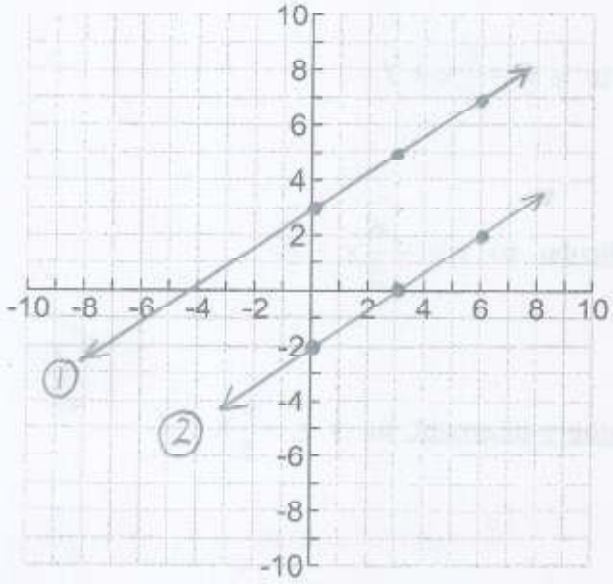
LESSON 9: PARALLEL AND PERPENDICULAR LINES

1) SLOPES OF PARALLEL LINES

Graph the following lines on the grid provided using their slope and y-intercept.

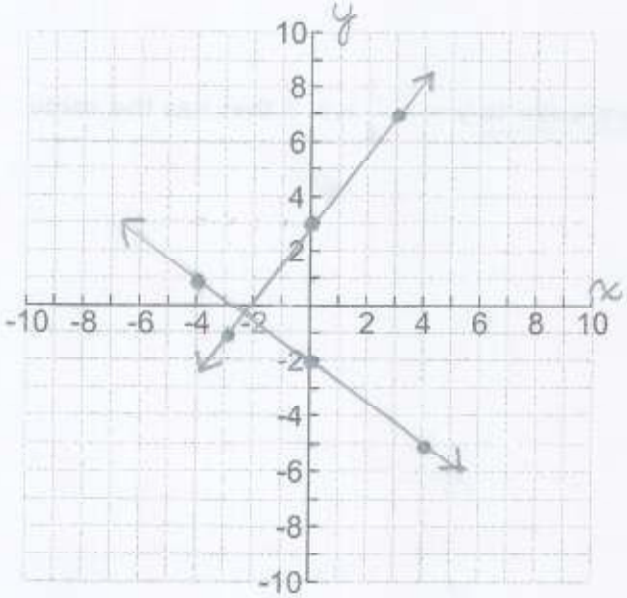
① $y = \overset{m}{\frac{2}{3}}x + \overset{b}{3}$ ② $y = \overset{m}{\frac{2}{3}}x - \overset{b}{2}$ ③ $y = \frac{2}{3}x$



2) SLOPES OF PERPENDICULAR LINES

Graph $y = \overset{m}{\frac{4}{3}}x + \overset{b}{3}$ and $y = -\overset{m}{\frac{3}{4}}x - \overset{b}{2}$ on the grid provided using their slope and y-intercept.

$\frac{-3}{+4} = \frac{+3}{-4}$



* Perpendicular (90°) lines have "opposite" slope.

negative reciprocal

↑ opposite sign

↑ opposite fraction

Name: _____

3) EXAMPLES

1. State the slope of a line that is parallel to $y = 3x + 2$.

$y = 3x + 5$

2. State the slope of a line that is perpendicular to $y = 3x - 1$

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

3. Consider the line $y = -\frac{6}{5}x + 7$.

a) State the equation of a line that is parallel to $y = -\frac{6}{5}x + 7$.

$y = \boxed{\frac{-6}{5}}x + \boxed{5}$

b) State the equation of a line that is perpendicular to $y = -\frac{6}{5}x + 7$.

$y = \boxed{\frac{5}{6}}x + \boxed{7}$

c) State the equation of a line that has the same y-intercept as $y = -\frac{6}{5}x + 7$.

$y = \boxed{\frac{-5}{7}}x + \boxed{7}$

4. State the slope of a line that is perpendicular to a line with undefined slope.

$m = 0$

5. Determine the equation of the line that is perpendicular to $y = -\frac{3}{4}x + 3$ that has the same y-intercept as the line $2x + 3y - 12 = 0$.

$\frac{2x}{-3} - \frac{12}{-3} = \frac{3y}{3}$

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

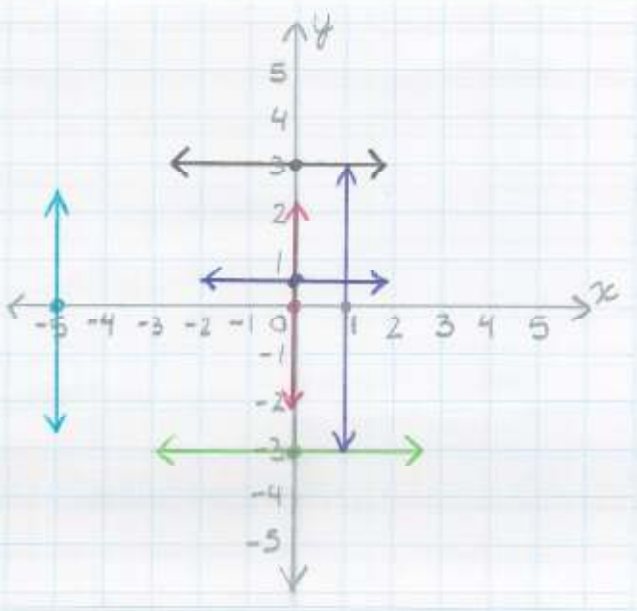
$\frac{-2}{3}x + 4 = y$

$6 = 4$

* $y = mx + b$ $\quad y = \frac{4}{3}x + 4$

Parallel and Perpendicular Lines
Lesson 9

pg 139 (#1-15) ① a) $x = 1$ b) $y = -3$ c) $x = -5$
d) $y = 3$ e) $x = 0$ f) $y = \frac{1}{2}$



② The vertical change is equal to zero for a horizontal line.

③ The horizontal change is equal to zero for a vertical line.

④ a) $m = 0$, $y = -2$ b) $m =$ undefined, $y = -2$
c) $m = 0$, $y = 2$ d) $m =$ undefined, $y = 3$

⑤ a) false b) true
c) false d) true

⑥ a) perpendicular b) neither
c) parallel d) perpendicular
e) neither f) neither