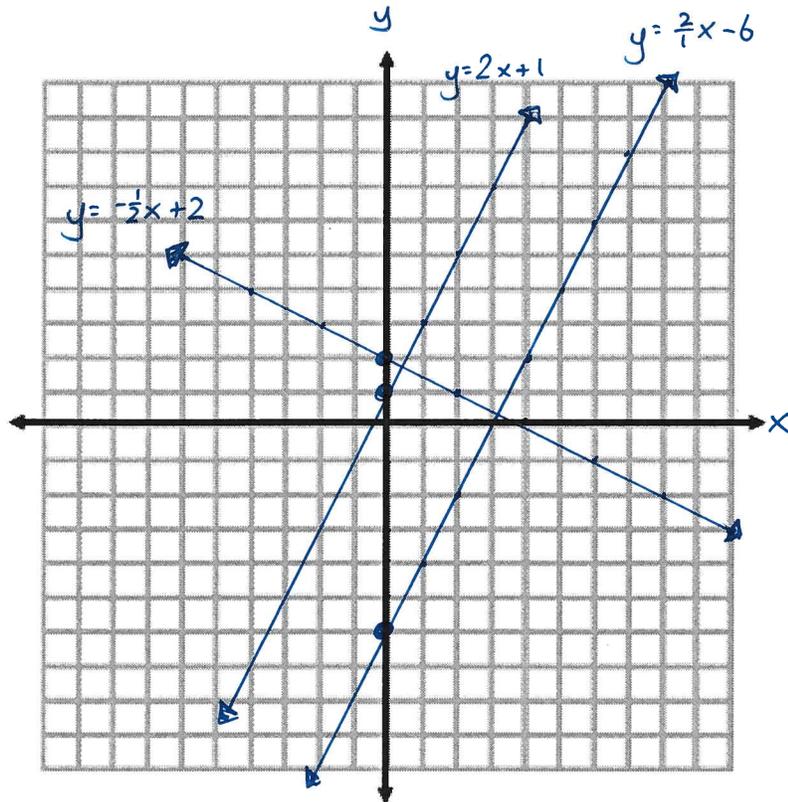Math 10C

L39 – 7.4 Parallel and Perpendicular Lines

Part 1 – Graphing Lines

Q1: Graph the following equations:

a) $y = 2x - 6$

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

c) $y = 2x + 1$

$y = \frac{2}{1}x - 6$

$y = 2x + 1$

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

By looking at the linear equations, how can you determine whether two lines are parallel?

Same slope.

Are Perpendicular?

Slope is "negative reciprocal"

or

"Flip and switch the sign"

Q2: Given a line $y = \frac{2}{3}x + 5$, what is the slope of a line...

a) That is parallel?

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

b) That is perpendicular?

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

KEYS

Q3: Identify whether the lines in each pair are parallel, perpendicular, or neither. Explain how you know.

a) $2x + 4y = 5$ and $-2x - 4y = 1$

$$2x + 4y = 5$$
$$-2x \qquad -2x$$
$$4y = -2x + 5$$
$$\div 4 \quad \div 4 \quad \div 4$$
$$y = -\tfrac{1}{2}x + \tfrac{5}{4}$$

$$-2x - 4y = 1$$
$$+2x \qquad +2x$$
$$-4y = 2x + 1$$
$$\div -4 \quad \div -4 \quad \div -4$$
$$y = -\tfrac{1}{2}x - \tfrac{1}{4}$$

Same slope?
Parallel!

b) $3x + y - 4 = 0$ and $0 = 3x - y - 2$

$$3x + y - 4 = 0$$
$$-3x \qquad -3x$$
$$y - 4 = -3x$$
$$+4 \qquad +4$$
$$y = -3x + 4$$

$$0 = 3x - y - 2$$
$$+y \qquad +y$$
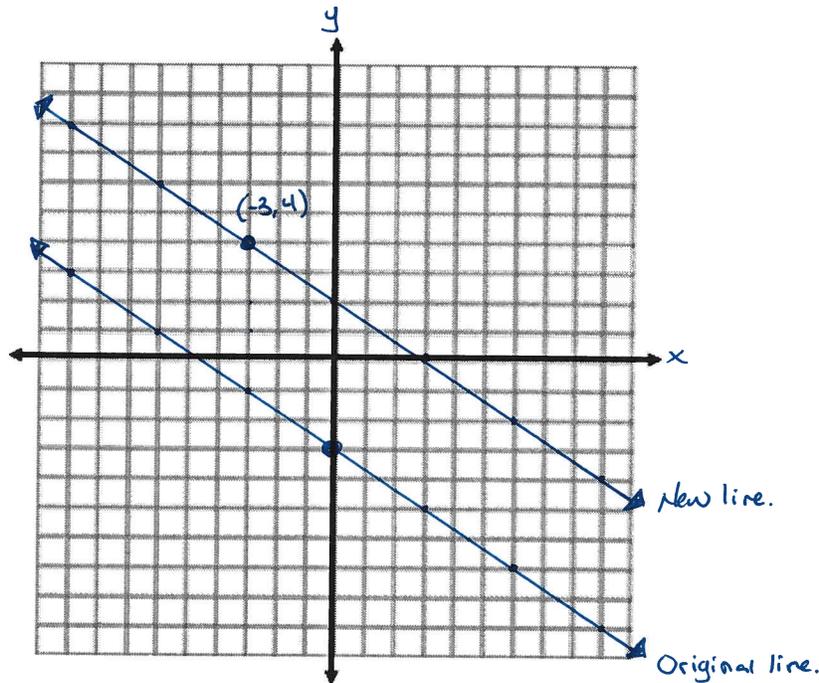$$y = 3x - 2$$

$$m = -\tfrac{3}{1} \qquad m = +\tfrac{3}{1}$$

Neither parallel or perpendicular.

KEY

Part 3 – Building Parallel or Perpendicular Lines

Q4: Determine an equation of a line in the form $y = mx + b$ that is parallel to the line and passes through the given point.

so same slope.

$$2x + 3y + 9 = 0, \quad (-3, 4)$$

(-3, 4)

New line.

Original line.

$2x + 3y + 9 = 0$
$-2x \qquad -2x$
$3y + 9 = -2x$
$\quad -9 \qquad -9$
$3y = -2x - 9$
$\div 3 \quad \div 3 \quad \div 3$

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

Original line.

$\Downarrow$

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

$\Downarrow$

$y = mx + b$
$y = -\frac{2}{3}x + b \qquad$ Use $(-3, 4)$
$4 = -\frac{2}{3}(-3) + b$
$4 = 2 + b$
$2 = b$

$\Downarrow$

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

Q5: Write an equation of a line in the form $y = mx + b$ that is perpendicular to the line and passes through the given point.

Original line

$$y = 3x + 1, \quad (1, 4)$$

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

New line
$y = -\frac{1}{3}x + b \qquad$ Use $(1, 4)$
$4 = -\frac{1}{3}(1) + b$
$4 = -\frac{1}{3} + b$
$\frac{13}{3} = b \qquad \Rightarrow \boxed{y = -\frac{1}{3}x + \frac{13}{3}}$

Part 6 – Textbook Practice

Pg. 390 #2, 5ace, 6ace, 7ace