

The Position of Straight Lines
Relative to Each Other

Recall: Parallel and Distinct Lines

- same slope (a) (m)
- different y-int (b) (k)

New: Parallel and Coincident Lines

- same slope
- same y-int
- ∴ same line

$$l_1: y = 3x + 2$$

$$l_2: 2y = 6x + 4$$

$$y = \frac{6x + 4}{2}$$

$$y = 3x + 2$$

What is the relation between l_1 and l_2

$l_1: y = \frac{1}{4}x - 2$

$y = ax + b$

$a_1 = \frac{1}{4} \quad b_1 = -2$

$a_1 = 0.25$

step i: identify slope
slope formula

$$a_2 = \frac{y_2 - y_1}{x_2 - x_1}$$

x_1, y_1
 $(-1, -2.25)$

x_2, y_2
 $(0, -2)$

$$a_2 = \frac{-2 - (-2.25)}{0 - (-1)}$$

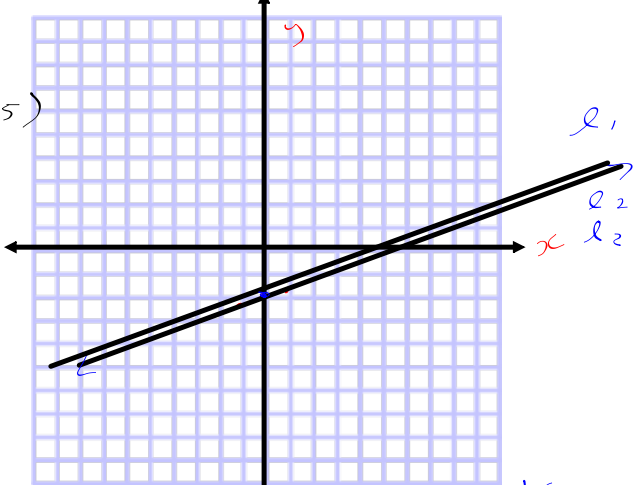
$$a_2 = \frac{-2 + 2.25}{1}$$

$a_2 = 0.25 = a_1$ ∴ lines ||

l_2

x	y
-1	-2.25
0	-2
1	-1.75

← y-int b_2



step ii find y-intercepts

$l_2: y = ax + b$
 $y = 0.25x + b$

sub in

$(0, -2)$
 $-2 = 0.25(0) + b$

$-2 = 0 + b$

$b_2 = -2$

Since $b_1 = -2 = b_2$

lines are || and coincident.

Describes lines

$l_1: y = -2x + 3$

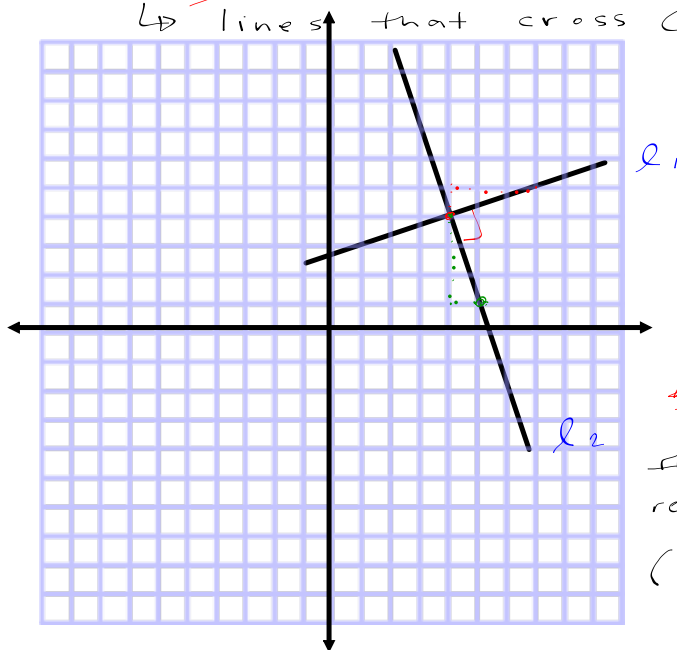
$l_2:$

x	y
-1	-1
0	-3
1	-5

Lesson 4: Identifying Parallel, Perpendicular, and Intersecting Non-Perpendicular Lines

Perpendicular Lines

↳ lines that cross @ a 90°



$$a_1 = \frac{1}{3}$$

$$a_2 = -\frac{3}{1}$$

↳ lines have negative reciprocal slopes
 $(a_1 \times a_2 = -1)$

if $l_1 \perp l_2$, then

$$a_1 = \frac{1}{2}$$

$$a_2 = -2$$

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

$$\frac{3}{4}$$

$$-\frac{1}{1}$$

$$1$$

$$\frac{4}{1}$$

$$-\frac{1}{4}$$

$$-\frac{8}{7}$$

$$\frac{7}{8}$$

Determine their relation.

l_1 :

$$-2x + 3y = 1$$

step i. find slopes

$$-2x + 3y = 1 + 2x \text{ isolate } y$$

$$3y = 2x + 1$$

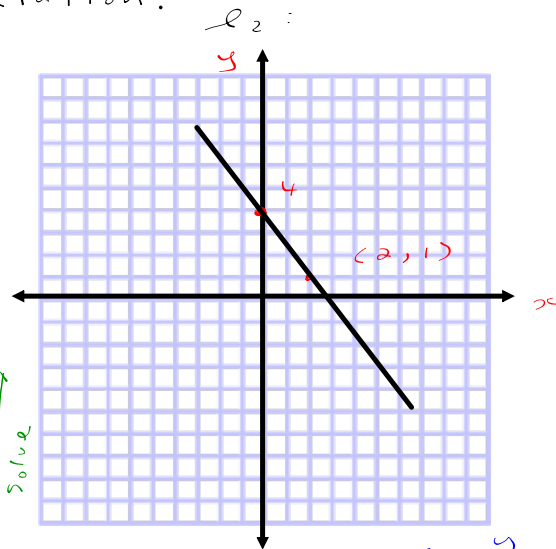
$$y = \frac{2}{3}x + \frac{1}{3}$$

$$y = ax + b$$

$$a_1 = \frac{2}{3} \quad b_1 = \frac{1}{3}$$

$$a_1 = 0.66$$

SUBSTITUTION
Solve



line 2
 $a_2 = \frac{y_2 - y_1}{x_2 - x_1}$

$$a_2 = -\frac{3}{2}$$

$$a_2 = -1.5$$

$$\begin{matrix} x_1 & y_1 \\ (0) & (4) \\ x_2 & y_2 \\ (2) & (1) \end{matrix}$$

step ii. check if negative reciprocals.

$$a_1 \times a_2 = -1$$

$$0.666666 (-1.5) = -1$$

∴ the lines are ⊥

Q I

Describe relationship

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

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

$$y = ax + b$$

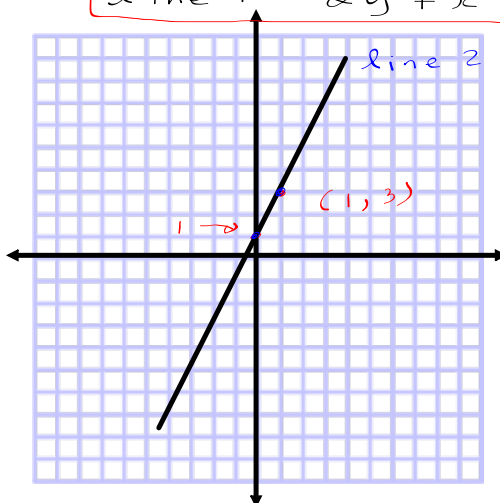
slopes not same
so not \parallel

not \perp

\star intersecting and non-perpendicular lines

Q II Describe relationship

$$\text{line 1: } 2y + x + 2 = 0$$



Hmwk:

P 144

2

P 140

7

P 142 a) b)

8 a) b)

9 a) b)

10 a) b)