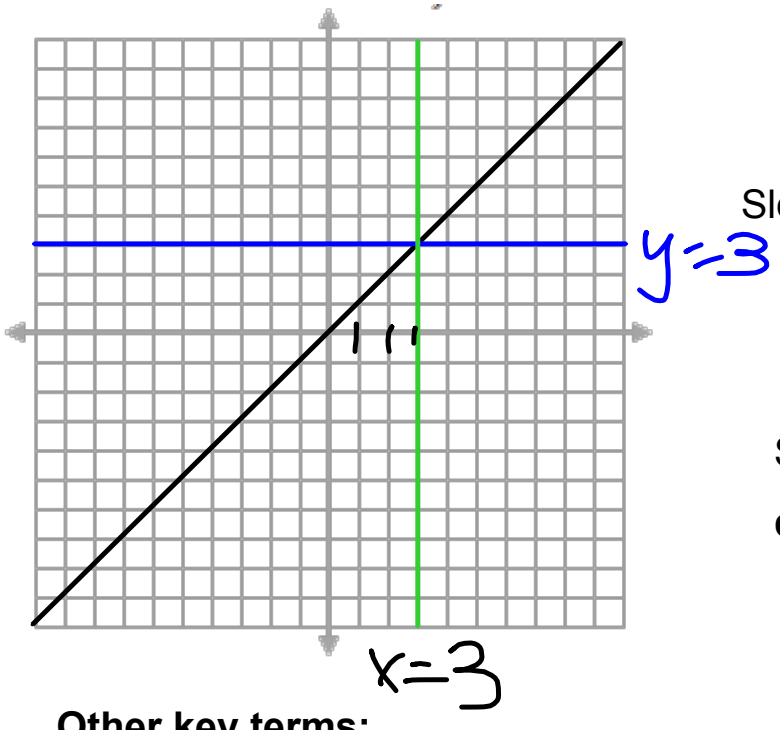
Slope of a Line

- ratio of vertical vs. horizontal change of a line (rise over run)

Slope

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



Slope for horizontal lines: **0**

$y = 0x + 3$

Slope for vertical lines:

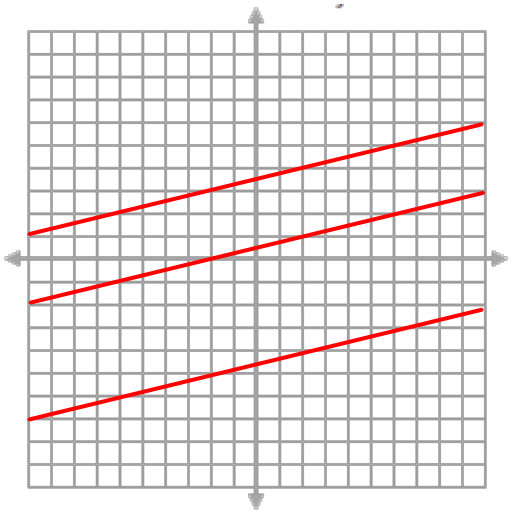
does not exist

Other key terms:

x-intercept: where the line meets the x-axis

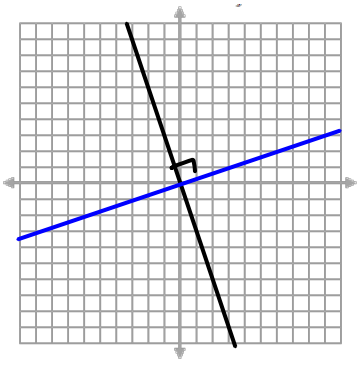
y-intercept: where the line meets the y-axis

Parallel and Perpendicular Lines



Parallel lines: Same slope

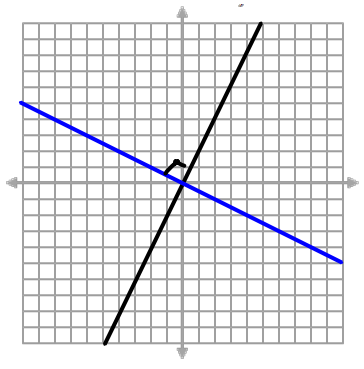
Compare the slopes of the two lines in each of the following:



Points: (0, 0) and (3, 1)

(0, 0) and (-2, 6)

$a = \frac{y_2 - y_1}{x_2 - x_1} = -3$ $a = \frac{1}{3}$



Points: (0, 0) and (2, -1)

(0, 0) and (2, 4)

$a = -\frac{1}{2}$

$a = 2$

Perpendicular lines: Slopes are **negative reciprocals**

reciprocal: $\frac{1}{3} \rightarrow \frac{3}{1}$

Equation of a Line

Function form: can be used for any non-vertical line

y = ax + b (x = -3) vertical line

Slope: a y-intercept: b (initial value) x-intercept: $\frac{-b}{a}$

e.g. p.94

2.a) A(4, 2) and B(5, -1) (x y)

Find the slope, equation, and intercepts.

① $a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1-2}{5-4} = -3$

② $y = ax + b$

$y = -3x + b$ Plug in points, slope

$2 = -3(4) + b$

$2 = -12 + b$

$b = 14$

$y = -3x + 14$

y-int: 14

x-int: $-\frac{b}{a} = -\frac{14}{-3} = 4\frac{2}{3} = 4.67$

Equation of a Line

General Form: can be used to describe any line

$Ax + By + C = 0$

$1x + 0y - 3 = 0$ $\quad x = 3$ $\quad x - 3 = 0$

Slope: $-\frac{A}{B}$ y-intercept: $-\frac{C}{B}$ x-intercept: $-\frac{C}{A}$

$x = 3$ Vertical line

1. Find equation in function form.
2. Rearrange to get rid of fractions.
3. Rearrange so all the terms are on the same side.

e.g. p. 94

2.a) A (4, 2) and B(5, -1)

1. $y = -3x + 14$

2. $3x + y - 14 = 0$ $\quad y = -\frac{3}{2}x + 14$ $\quad 2y = -3x + 28$

3. $0 = -3x - 1y + 14$

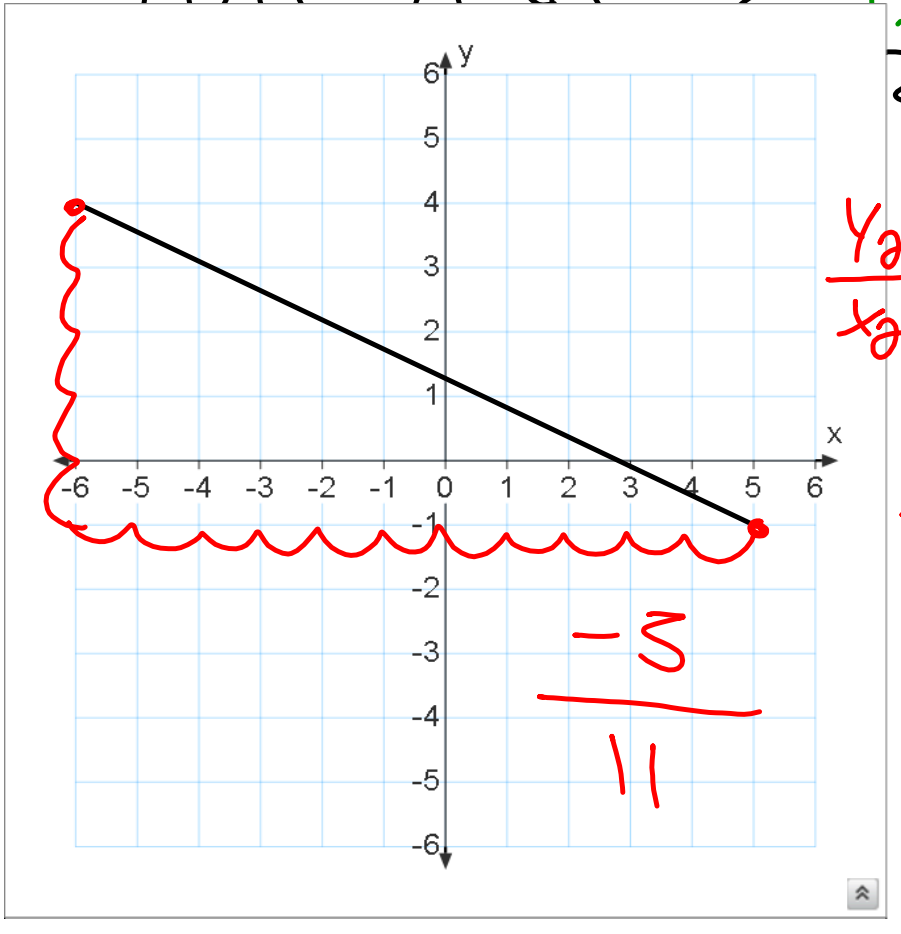
A B C

Slope: $-\frac{A}{B} = -\frac{(-3)}{1} = 3$ $\quad y = \frac{4}{2}x + 14$ $\quad y = 2x + 14$

HW: p.94 #1, 2, 4

Perpendicular bisector: perpendicular line through the midpoint

4. a) (0, 0) (6, −4)



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

rise/↓ run

$\frac{-5}{11}$