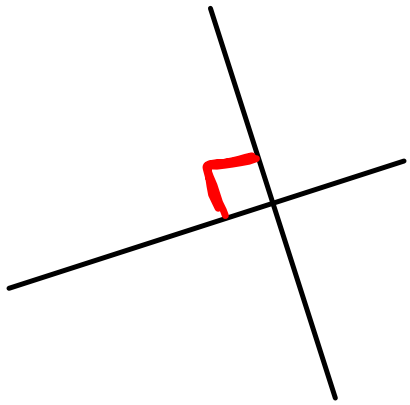
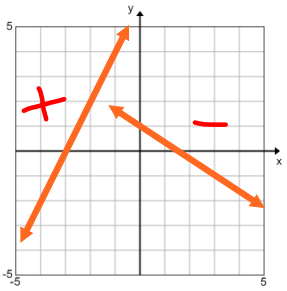
⊥ Perpendicular lines intersect at a 90° angle.

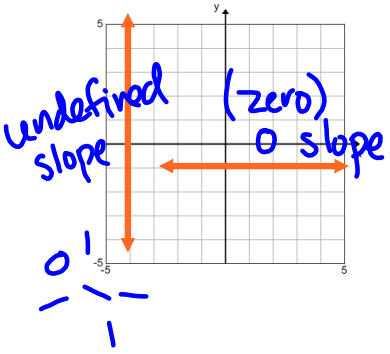


2-4: Slopes of Parallel and Perpendicular Lines

Review of slopes:

Slope = $\frac{rise}{run}$ or $\frac{y_2 - y_1}{x_2 - x_1}$





0
1
1

Slope = $\frac{rise}{run}$ or $\frac{y_2 - y_1}{x_2 - x_1}$

Find the slope of the line through the points given.

(2, -3) and (4, 5)

x_1, y_1 x_2, y_2

Slope $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 + 3}{4 - 2} = \frac{8}{2} \rightarrow 4$

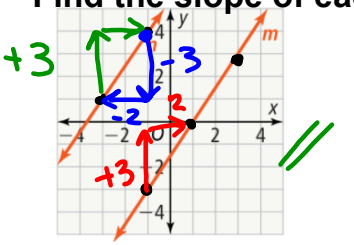
slope

(-3, -6) and (-1, 2)

$\frac{2 - -6}{-1 - -3} = \frac{8}{2}$

4

Find the slope of each line.

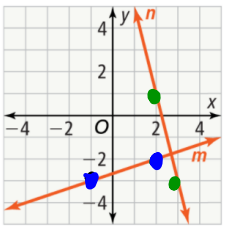


Slope of n: $\frac{3}{2}$

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

Slope of m: $\frac{3}{2}$

These lines are // because they have the same slope.



Slope of n: $-\frac{4}{1}$

Slope of m: $\frac{1}{3}$

Neither // nor perpendicular.

Slopes of Parallel and Perpendicular Lines

Parallel Lines: Slopes are Equal (same slope)

ex: 2 and 2 $\quad \frac{1}{4}$ and $\frac{1}{4}$

Perpendicular Lines: Product of slopes is -1

or... slopes are opposite reciprocals.

+/- signs change + numerator and denominator switch

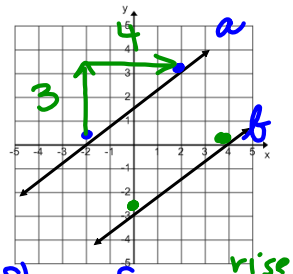
Examples:

$\frac{3}{4}$ and $\frac{-4}{3}$ $\quad -\frac{1}{5}$ and $\frac{5}{1}$ or 5 $\quad \frac{8}{1}$ and $\frac{-1}{8}$ $\quad 0$ and undefined ↔ ↕

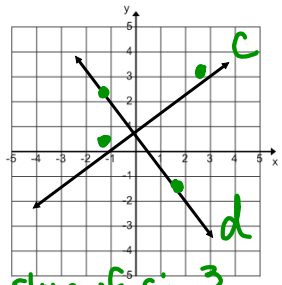
Go back to the last 2 graphs on the previous page (Friday)

Determine if the lines are parallel, perpendicular, or neither.

Find the slopes of the lines below and determine the same thing.



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



Slope of a: rise/run $\frac{3}{4}$

Slope of b: $\frac{3}{4}$

The lines are parallel because the slopes are the same.

Slope of c: $\frac{3}{4}$

slope of d: $\frac{-4}{3}$

The lines are perpendicular because they have opp. reciprocal slopes

b

Equation of a line: $y = mx + b$ (m = slope, b = y-int; y-int)

Find the slope of each line.

Which lines are parallel? Which lines are perpendicular?

$y = mx + b$

line a: $y = -2x + 4$ — slope of a: $\frac{-2}{1}$

line b: $y = 2x + 1$ — slope of b: $\frac{2}{1}$

line c: $y = \frac{1}{2}x - 3$ — slope of c: $\frac{1}{2}$

line d: $y = -\frac{1}{2}x + 1$ — slope of d: $\frac{-1}{2}$

b

b

Line a is perpendicular (b) to line c.

Line b is perpendicular (b) to line d.

(Copy on a blank sheet of paper)

Practice with slopes of parallel and perpendicular lines

1. Find the slopes of the lines parallel to: (same slopes)

a) $y = \frac{1}{3}x + 2$ // line's slope: $\frac{1}{3}$

b) $y = -5x + 3$ // line's slope: -5

c) $y = \frac{-2}{5}x - 1$ // line's slope: $-\frac{2}{5}$

Practice with slopes of parallel and perpendicular lines

2. Find the slopes of the lines perpendicular to: (⊥ lines have opp. reciprocal slopes)

a) $y = \frac{2}{5}x + 2$ ⊥ line's slope: $-\frac{5}{2}$

b) $y = \frac{3}{1}x + 3$ ⊥ line's slope: $-\frac{1}{3}$

c) $y = \frac{-6}{5}x - 1$ ⊥ line's slope: $\frac{5}{6}$