Your name

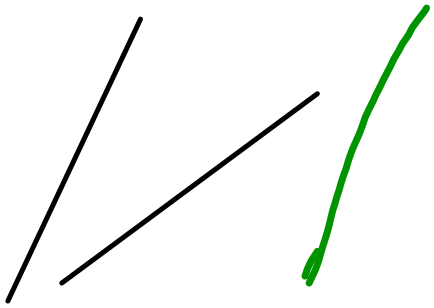
Mrs. Theo

Slopes of // and ⊥ Lines

10/5/21

Parallel Perpendicular

Notes



Slope-Intercept Form

$$y = \underline{m}x + \underline{b}$$

- Slope
- Rate of change (per)
- Coefficient

- y-intercept
- Initial "value"
- Constant

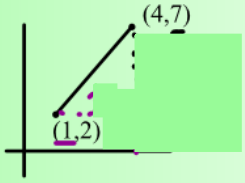
Methods of Finding Slope

Ex: (1,2) and (4,7)

- Slope Formula $m = \frac{y_2 - y_1}{x_2 - x_1}$

- Graphical Method

$\frac{\text{Rise}}{\text{Run}}$



- Stack Method

$\frac{\text{Rise}}{\text{Run}}$

(1,2)

(4,7)

Slopes

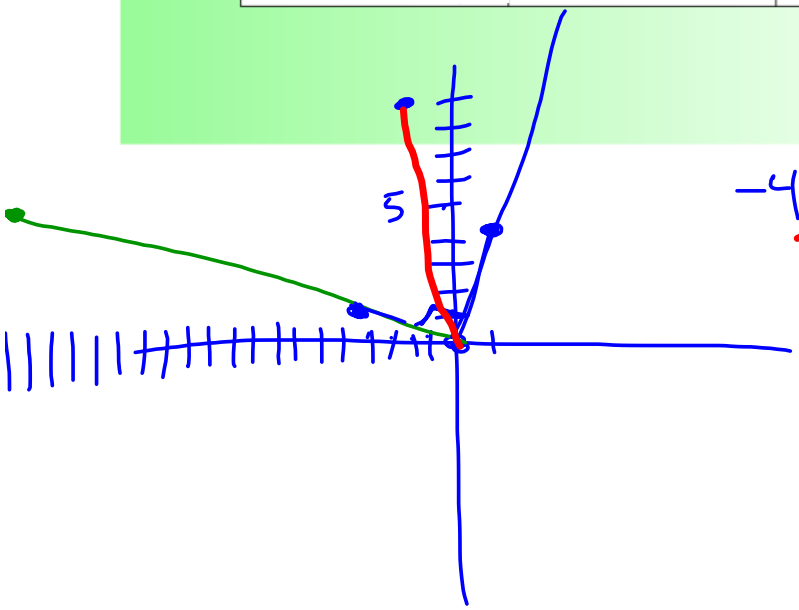
- Parallel Lines
- Perpendicular Lines

Same slope so they do not intersect

Slopes are opposite reciprocals (Sign (negative) Flip the Fraction) intersecting at a 90° angle

Fill in the missing slopes in the table below.

Slope	Slope of Parallel Line (same //)	Slope of Perpendicular Line
$\frac{2}{3}$	$\frac{2}{3}$	$-\frac{3}{2}$
-5	$-5 = \frac{-5}{1}$	$+\frac{1}{5}$
$4\frac{1}{5}$	$4\frac{1}{5} = \frac{21}{5} = 4.2$	$-\frac{5}{21} = -\frac{1}{4.2}$
1.6	$1.6 = 1\frac{6}{10} = \frac{16}{10} = \frac{8}{5}$	$-\frac{1}{1.6} = -\frac{5}{8}$



$-4\frac{5}{1} - 9$ $-\frac{5}{21}$

ACT/SAT Example

Which two lines are perpendicular?

- Not: $y = -5x + 2$ and $2y - 10x = 4$ — $m = -5$
- Not: $y = \frac{1}{4}x + 1$ and $y = 4x + 2$ — $m_1 = \frac{1}{4}$ $m_2 = 4$
- Not: $y = 3x + 1$ and $y - 4x = 6$ — $m_1 = 3$ $m_2 = 4$
- $y = \frac{1}{2}x + 2$ and $y + 2x = -4$,

$2y - 10x = 4$
$+10x \quad +10x$
$\frac{2y}{2} = \frac{10x + 4}{2}$
$y = 5x + 2$
$m = 5$

$y - 4x = 6$
$+4x \quad +4x$
$y = 4x + 6$

$m_1 = \frac{1}{2}$

$-2x \quad -2x$
$y = -2x - 4$

$m_2 = -2$

These slopes are perpendicular

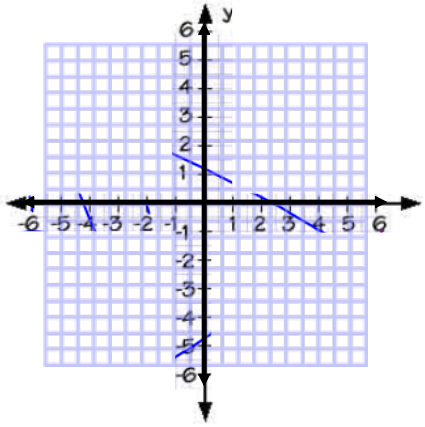
Mental Floss

a.) Plot the following points on a coordinate grid.

$A(-6, 4)$

$B(-2, -6)$

$C(6, -2)$



b.) Find the slopes of all 3 sides of triangle ABC.

c.) Is triangle ABC a right triangle? Justify your answer.

No, because none of the slopes are perpendicular (opposite and reciprocals)

I CAN write the equation of a line parallel or perpendicular to a given line and passing through a given point.

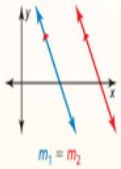
Theorems

Theorem 3.13 Slopes of Parallel Lines

In a coordinate plane, two distinct nonvertical lines are parallel if and only if they have the same slope.

Any two vertical lines are parallel.

Proof p. 439; Ex. 41, p. 444



Theorem 3.14 Slopes of Perpendicular Lines

In a coordinate plane, two nonvertical lines are perpendicular if and only if the product of their slopes is −1.

Horizontal lines are perpendicular to vertical lines.

Proof p. 440; Ex. 42, p. 444

Forms for the Equation of a Line

Slope-Intercept	$y = mx + b$	m is the slope b is the y-intercept
Point-Slope	$y - y_1 = m(x - x_1)$	m is the slope (x_1, y_1) is a point on the line
Standard Form	$ax + by = c$	a is positive

m= -a/ b

If you're given two points (x_1, y_1) and (x_2, y_2)

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

288 × 166

1. Write the equation of the line that is parallel to the graph of $y = \frac{1}{2}x + 6$, and whose y-intercept is -2.

$b = -2$ $\quad m = \frac{1}{2}$ $\quad m_{\parallel} = \frac{1}{2}$

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

3. Write the equation of the line that is parallel to the graph of $3x - y = 5$, and whose y-intercept is (0, -7).

$y = 3x - 7$

$-3x \quad -3x$

$\frac{-y}{-1} = \frac{-3x + 5}{-1}$

$y = 3x - 5$

$m = 3 \quad m_{\parallel} = 3$

Write the slope-intercept form of an equation of the line that passes through the given point and is parallel to the graph of each equation.

5. (3, 2), $y = x + 5$

$m = 1$

$m_{\parallel} = 1$

$y = mx + b$

$2 = 1(3) + b$

$2 = 3 + b$

$-3 \quad -3$

$-1 = b$

$y = 1x - 1$

6. (-2, 5), $y = -4x + 2$

XY

$m = -4$

$m_{\parallel} = -4$

$y = mx + b$

$5 = -4(-2) + b$

$5 = 8 + b$

$-8 \quad -8$

$-3 = b$

$y = -4x - 3$

9. Write the equation of the line that is perpendicular to the graph of $y = \frac{1}{2}x + 6$, and whose y-intercept is (0, -2).

$b = -2$

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

$m_{\perp} = -\frac{2}{1} = -2$

$y = -2x + -2$

$y = -2x - 2$

11. Write the equation of the line that is perpendicular to the graph of $3x - y = 5$, and whose y-intercept is -7.

$= b$

$y = 3x - 5$

$m = 3$

$m_{\perp} = -\frac{1}{3}$

$y = -\frac{1}{3}x - 7$

Write the slope-intercept form of an equation of the line that passes through the given point and is perpendicular to the graph of each equation.

13. (3, 2), $y = x + 5$

$y = -1x + 5$ XY $m = 1$ $m_{\perp} = -1$

$y = mx + b$

$2 = -1(3) + b$

$2 = -3 + b$

$+3 \quad +3$

$5 = b$

14. (-8, 5), $y = -4x + 2$

XY

$m = -4$

$m_{\perp} = \frac{1}{4}$

$y = mx + b$

$5 = \frac{1}{4}(-8) + b$

$5 = -2 + b$

$7 = b$

$y = \frac{1}{4}x + 7$

Decide if the lines with the given equations are parallel, Perpendicular, coincide , or are just intersecting lines.

17. $y = 3x + 2$
$9x - 3y = -6$

Parallel

↳ $y = 3x + 2$

18. $y = -2x + 3$
$2x - 4y = 8$

Perpendicular

↳ $y = \frac{1}{2}x - 2$

$m = -2$

$m_{\perp} = \frac{1}{2}$ ✓

19. $y = 4x + 1$
$8x - 2y = 2$

$m = 4$

Parallel

$-8x \quad -8x$

$\frac{-2y}{-2} = \frac{-8x + 2}{-2}$

$y = 4x - 1$

$m = 4$

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

$y = -x + 4$

$m_1 = \frac{2}{3}$

$m_2 = -1$

just intersecting