

TH-6 Geometry Week 16

3-6 Slopes of Parallel and Perpendicular Lines

Parallel lines have the same or equal slopes.

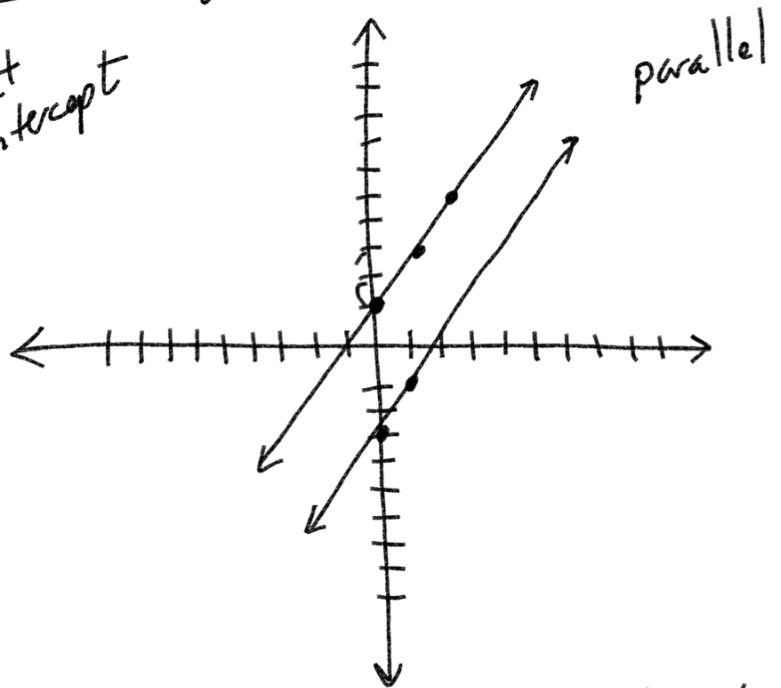
no touching

$y = 2x + 1$  ← start at y-intercept

slope-intercept form

$y = mx + b$   
↑ slope      ↘ y-intercept

$y = 2x - 3$



Perpendicular Lines - lines that intersect at a 90° angle.

Have slopes that are opposite inverses

$y = \frac{2}{3}x - 4$  ← y-intercept

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

1<sup>st</sup> point: y-intercept

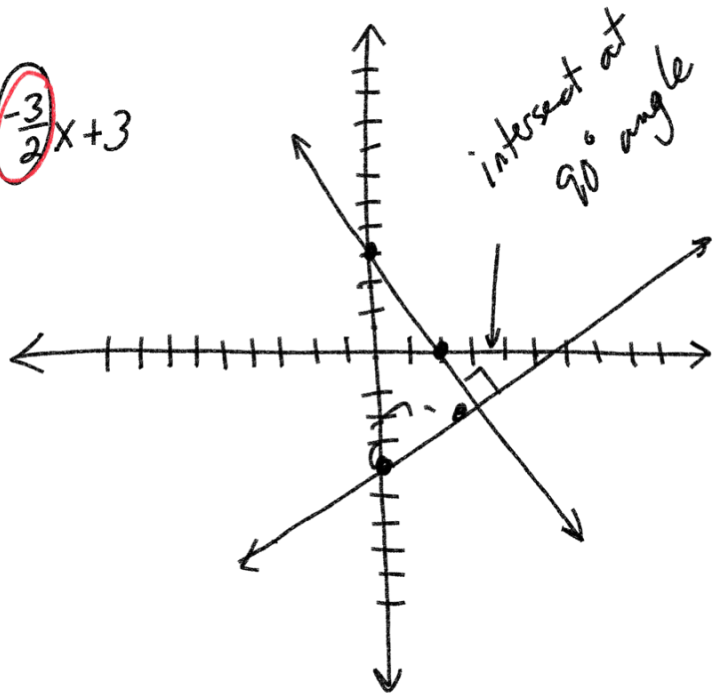
2<sup>nd</sup> point: Use slope

$\frac{2}{3}$       up 2  
            right 3

opposite      inverse

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

change sign      flip



Find the equation for a line parallel to the line  $y = 3x + 2$  that goes through the point  $(4, -2)$ .  
parallel lines have same slope.

$$\left[ m = 3 \quad (4, -2) \right]$$

slope-intercept  $y_1$   
 $y = mx + b$

$$-2 = (3)(4) + b$$

$$-2 = 12 + b$$

$$-12 \quad -12$$

$$-14 = b$$

$$y = mx + b$$

$$\boxed{y = 3x - 14}$$

point-slope

$$y - y_1 = m(x - x_1)$$

$$y - (-2) = 3(x - 4)$$

$$y + 2 = 3(x - 4)$$

$$y + 2 = 3x - 12$$

$$-2 \quad -2$$

$$\boxed{y = 3x - 14}$$

Find the equation for a line perpendicular to the line  $y = -\frac{3}{4}x + 5$  that goes through the point  $(2, -8)$ .

Given slope:  $-\frac{3}{4} \xrightarrow{\text{opposite}} \frac{3}{4} \xrightarrow{\text{inverse}} \frac{4}{3}$

$$m = \frac{4}{3} \quad (2, -8)$$

change sign

$$-8 = -\frac{24}{3}$$

$$y - y_1 = m(x - x_1)$$

$$y - (-8) = \frac{4}{3}(x - 2)$$

$$y + 8 = \frac{4}{3}(x - 2)$$

$$y + 8 = \frac{4}{3}x - \frac{8}{3}$$

$$-8 \quad -8$$

$$y = \frac{4}{3}x - 8 - \frac{8}{3}$$

$$y = \frac{4}{3}x - \frac{24}{3} - \frac{8}{3} = \boxed{y = \frac{4}{3}x - \frac{32}{3}}$$

Find the equation for the line perpendicular to

$$y = 2x - 7 \text{ that goes through } (-1, -9)$$

given slope

$$\frac{2}{1} \rightarrow$$

opposite inverse

$$\frac{-2}{1} \rightarrow -\frac{1}{2}$$

$$m = -\frac{1}{2} \quad (-1, -9)$$

$$-9 = \frac{-18}{2}$$

$$y = -\frac{1}{2}x - 9 - \frac{1}{2}$$

$$y = -\frac{1}{2}x - \frac{18}{2} - \frac{1}{2}$$

$$\boxed{y = -\frac{1}{2}x - \frac{19}{2}}$$

$$y - y_1 = m(x - x_1)$$

$$y - (-9) = -\frac{1}{2}(x - (-1))$$

$$y + 9 = -\frac{1}{2}(x + 1)$$

$$y + 9 = -\frac{1}{2}x - \frac{1}{2}$$

$$-9 \quad -9$$

Find the equation for the line parallel to

$$4x - 2y = 8$$

that goes through  $(3, -7)$

$$+2y \quad +2y$$

$$4x = 2y + 8$$

$$-8$$

$$\frac{2y}{2} = \frac{4x - 8}{2} - \frac{8}{2}$$

$$\{ y = 2x - 4 \}$$

slope  $(=2)$

$$y = mx + b$$

slope

$$\{ m = 2 \quad (3, -7) \}$$

$$y = mx + b$$

$$-7 = (2)(3) + b$$

$$-7 = 6 + b$$

$$-6 \quad -6$$

$$\boxed{-13 = b}$$

$$\boxed{y = 2x - 13}$$

Find the equation for a line perpendicular to  $8x - 4y = 16$  that goes through  $(-2, 6)$

$$\begin{aligned} 8x - 4y &= 16 \\ -8x & \quad -8x \\ \hline -4y &= -8x + 16 \\ \hline \frac{-4y}{-4} &= \frac{-8x}{-4} + \frac{16}{-4} \end{aligned}$$

$$\{ y = 2x - 4 \}$$

↑ slope

{ slope of given line }

$\frac{2}{1} \rightarrow$  opposite  $\frac{-2}{1} \rightarrow$  inverse  $\left( \frac{-1}{2} \right)$

$$\left[ \begin{array}{c} m = -\frac{1}{2} \\ (-2, 6) \\ \uparrow \quad \uparrow \\ x \quad y \end{array} \right]$$

$$\{ y = mx + b \}$$

$$\begin{aligned} 6 &= \left(-\frac{1}{2}\right)(-2) + b \\ 6 &= 1 + b \\ -1 & \quad -1 \end{aligned} \quad \textcircled{5 = b}$$

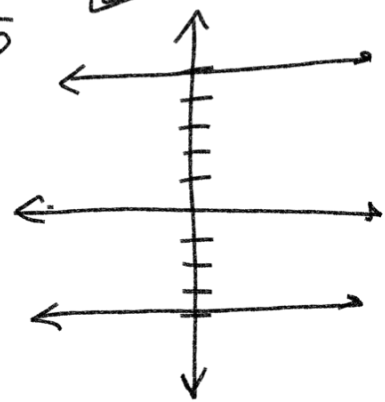
$$\begin{aligned} y - y_1 &= m(x - x_1) \\ \uparrow \quad \uparrow \quad \uparrow \\ 6 \quad -\frac{1}{2} \quad -2 \end{aligned}$$

$$\boxed{y = -\frac{1}{2}x + 5}$$

Find the equation for a line parallel to  $y = 5$  that goes through  $(3, -4)$

$$\begin{aligned} y &= 5 \\ y &= mx + b \\ y &= mx + 5 \end{aligned}$$

$$\left[ \textcircled{m = 0} \quad (3, -4) \right]$$



$$\begin{aligned} y &= mx + b \\ -4 &= (0)(3) + b \\ -4 &= 0 + b \end{aligned}$$

$$\textcircled{-4 = b}$$

$$\begin{aligned} y &= mx + b \\ y &= (0)x - 4 \end{aligned}$$

$$\boxed{y = -4}$$

HW

3-6 evens

Supplemental WS

Online HW 16

Quiz 16

Pre-Test

HW/ Quiz 14 due tonight

Jan 28<sup>th</sup>