

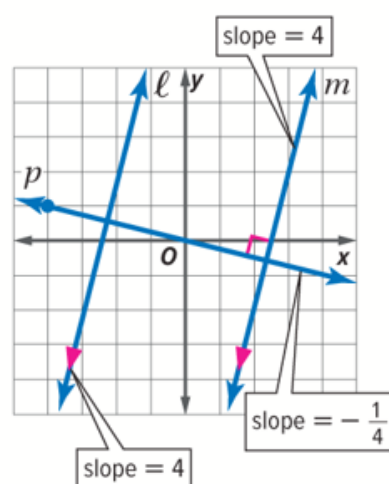
Theorems Parallel and Perpendicular Lines

2.18 Slopes of Parallel Lines Two nonvertical lines have the same slope if and only if they are parallel. All vertical lines are parallel.

Example Parallel lines ℓ and m have the same slope, 4.

2.19 Slopes of Perpendicular Lines Two nonvertical lines are perpendicular if and only if the product of their slopes is -1 . Vertical and horizontal lines are perpendicular.

Example line $m \perp$ line p
product of slopes = $4 \cdot -\frac{1}{4}$ or -1



Determine whether \overline{FG} and \overline{HJ} are *parallel*, *perpendicular*, or *neither* for $F(1, -3)$, $G(-2, -1)$, $H(5, 0)$, and $J(6, 3)$. Graph each line to verify your answer.

$$\overleftrightarrow{FG} = \frac{-1 - -3}{-2 - 1} = \frac{2}{-3}$$

$$\overleftrightarrow{HJ} = \frac{3 - 0}{6 - 5} = \frac{3}{1}$$

NEITHER

Determine whether \overline{AB} and \overline{CD} are *parallel*, *perpendicular*, or *neither* for $A(-2, -1)$, $B(4, 5)$, $C(6, 1)$, and $D(9, -2)$

$$\overleftrightarrow{AB} = \frac{5 - -1}{4 - -2} = \frac{6}{6} = \frac{1}{1} \quad \frac{1}{1}$$

$$\overleftrightarrow{CD} = \frac{-2 - 1}{9 - 6} = \frac{-3}{3} = -\frac{1}{1} \quad \frac{-1}{1}$$

Perpendicular

$$y = mx + b$$

Write an equation of a line that passes through $(-4, 3)$ and is perpendicular to the line whose equation is $y = 4x - 1$ in slope intercept form.

$$m = 4 \quad m_{\perp} = -\frac{1}{4}$$

$$3 = -\frac{1}{4}(-4) + b$$

$$3 = 1 + b$$

$$b = 2$$

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

Write an equation of a line that passes through $(2, -1)$ and is parallel to the line whose equation is $y = \frac{1}{2}x + 4$ in slope intercept form.

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

slope =

$$-1 = \frac{1}{2}(2) + b$$

$$-1 = 1 + b$$

$$-1 - 1$$

$$b = -2$$

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

Write an equation of a line that passes through (2,-5) and is perpendicular to the line whose equation is $y = \frac{1}{4}x + 7$ in slope intercept form

$$m = \frac{1}{4} \quad m_{\perp} = -4$$

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

$$-5 = -8 + b$$

$$3 = b$$

$$y = -4x + 3$$

Write an equation of a line that passes through (3,-2) and is parallel to the line whose equation is $y = \frac{2}{3}x + 5$ in slope intercept form

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

$$-2 = \frac{2}{3}(3) + b$$

$$-2 = 2 + b$$

$$-4 = b$$

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