$$y = mx + b$$

Write the equation of the line that passes through the points (10,-4) and (3,-1) in slope intercept form.

x y

$m = \frac{-1 - -4}{3 - 10} = \frac{3}{-7}$

$-1 = -\frac{3}{7}(3) + b$

$-7 \cdot -1 = -\frac{3}{7}(3) + b \cdot 7$

$7 = 9 + -7b$

$-9 \quad -2 = -7b \quad b = \frac{2}{7}$

$-7 \quad -7$

$y = -\frac{3}{7}x + \frac{2}{7}$

Write the equation of the line that passes through the points (2,-3) and (-4,1) in point slope form.

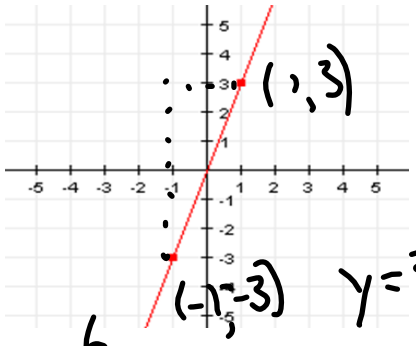
$x_1 y_1$

$m = \frac{1 - -3}{-4 - 2} = \frac{4}{-6}$

y_1

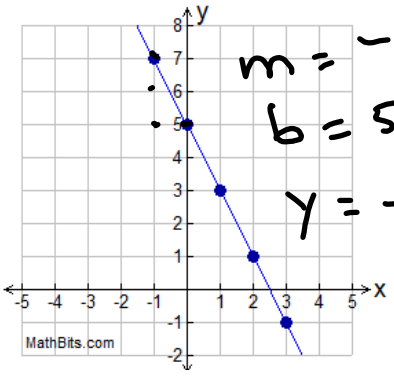
$y - 1 = \frac{-2}{3}(x + 4)$ $\quad -\frac{2}{3}$

Write an equation in slope intercept form from the graph.



$y = 3x$

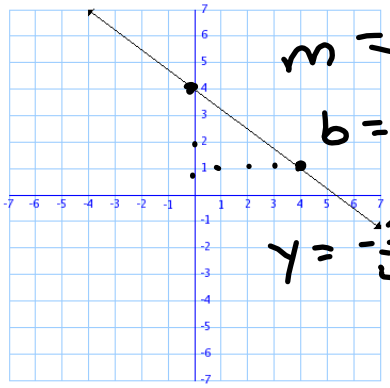
$m = \frac{6}{2} = 3$ $b = 0$



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

$b = 5$

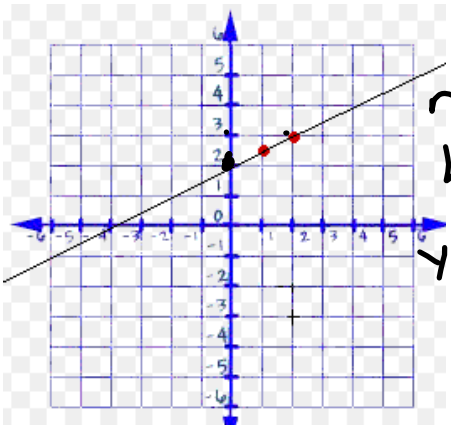
$y = -2x + 5$



$m = \frac{-3}{4}$

$b = 4$

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



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

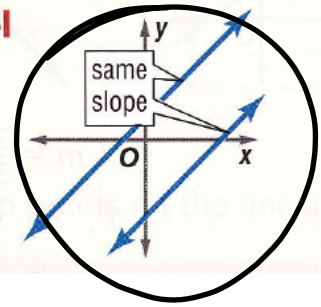
$b = 2$

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

Parallel and Perpendicular Lines

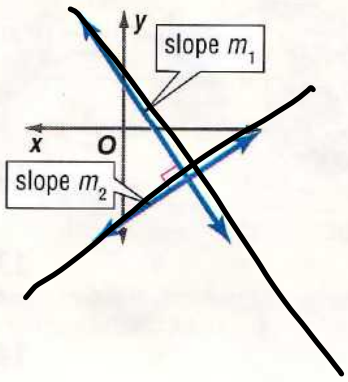
Key Concept — Parallel Lines

- **Words** In a plane, nonvertical lines with the same slope are parallel. All vertical lines are parallel.
- **Model**



Key Concept — Perpendicular Lines

- **Words** In a plane, two oblique lines are perpendicular if and only if the product of their slopes is -1.
- **Symbols** Suppose m_1 and m_2 are the slopes of two oblique lines. Then the lines are perpendicular if and only if $m_1 m_2 = -1$, or $m_1 = -\frac{1}{m_2}$.
- **Model**



The slopes of perpendicular lines are *opposite reciprocals.*

$m = \frac{3}{5}$ $m_\perp = -\frac{5}{3}$ $\perp$

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

$m = \frac{3}{7}$

$m = \frac{2}{3}$ $m_\perp = -\frac{3}{2}$

$m = \frac{9}{21}$

?

$y = mx + b$ x y

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.

$m = 4$

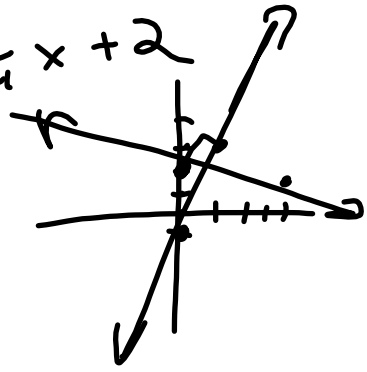
$m_{\perp} = -\frac{1}{4}$

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

$3 = 1 + b$

$2 = b$

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



x y

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.

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

$m_{\parallel} = \frac{1}{2}$

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

$-1 = 1 + b$

$-1 \quad -1$

$-2 = b$

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

x, y

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

$m = \frac{1}{4}$

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

$y = mx + b$

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

$-5 = -8 + b$

$3 = b$

$y = -4x + 3$

$y = mx + b$

x, y

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

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

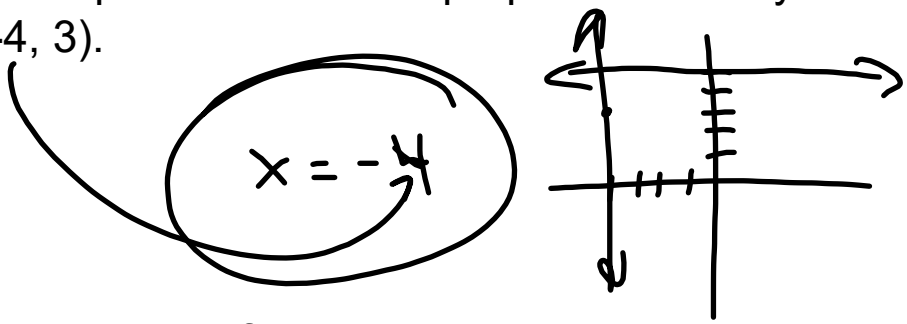
$-2 = \frac{2}{3}(3) + b$

$-2 = 2 + b$

$-4 = b$

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

Write the equation of the line perpendicular to y=5 through the point (-4, 3).



Write the equation of the line perpendicular to x=3 through the point (-7, 4).

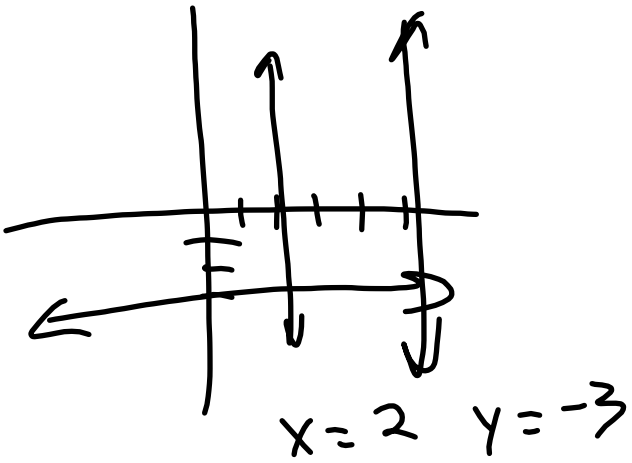
y = 4

Write the equation of the line perpendicular to y=-2 through the point (6, 9).

x = 6

y = 4 parallel

y = 6 (2, 6)


x = 2 y = -3

For each of the following pairs of equations, tell whether the lines are parallel or perpendicular or neither.

1) $2x - y = 3;\ y = 2x + 5$

$\frac{-y}{-1} = \frac{-2x}{-1} + \frac{3}{-1}$

$y = 2x - 3$

2) $3x + 5y = 8;\ 5x - 3y = 9$

$m = -\frac{A}{B}$

$= \frac{-3}{5}$ $\frac{-5}{-3} = \frac{5}{3}$ perpendicular

$y = mx + b$

3) $2(x - 1) = 3y;\ y = 2x - 1$

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

$y = \frac{2}{3}x - \frac{2}{3}$ $m = 2$ neither

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

$3x + 5y = 6$ $5x - 3y = 2$

$m = \frac{-3}{5}$ $m = \frac{-5}{-3} = \frac{5}{3}$

perpendicular