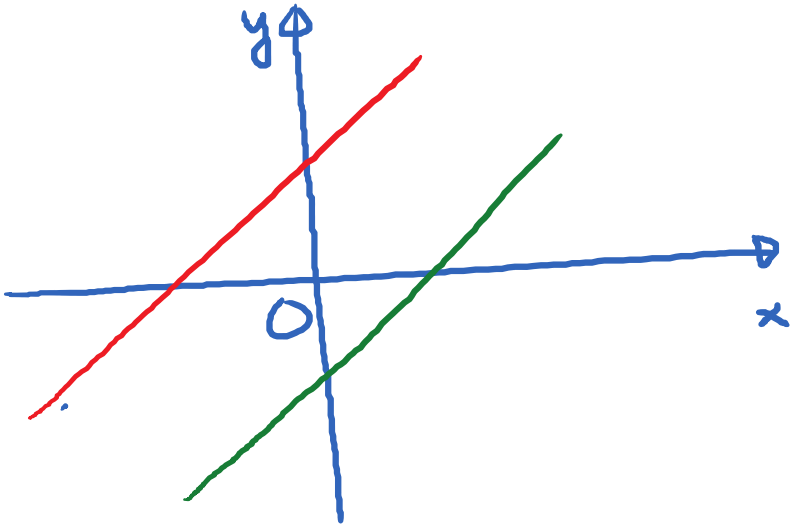
2.4. More on Slopes

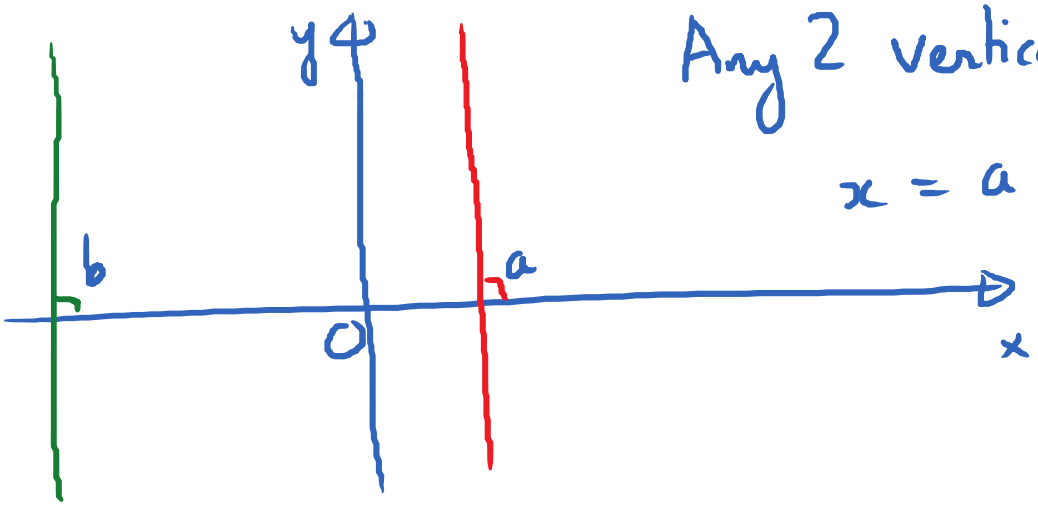
Tuesday, October 3, 2017 10:00 AM

Obj 1: Parallel Lines.



For nonvertical lines.

2 lines are parallel if and only if they have the same slope.



Any 2 vertical lines $x = a$ and $x = b$ are parallel

E.g. Line L passes through $(-2, 5)$

L is parallel to the line M whose equation is $(M): y = 3x + 1$.

Q: Write the point-slope and the slope-intercept equation for L.

Sol: Since L is parallel to M, they must have the same slope. Slope of M is 3.

Hence, the slope of L must be $\boxed{3}$

L passes through $(-2, 5)$

$$y - 5 = 3\left(x - (-2)\right) \rightarrow \text{Point-Slope}$$

$$y - 5 = 3(x + 2)$$

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

$$\boxed{y = 3x + 11} \rightarrow \text{Slope-intercept Equation}$$

E.g. $(2,4)$; $(-8,-5)$ (x_1, y_1 ; x_2, y_2)

Write the point-slope and slope intercept equation of the line L which passes through $(1,-1)$ and parallel to the line M which panes through the 2 given points.

$$\text{Slope of } M = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5-4}{-8-2} = \frac{-9}{-10} = \frac{9}{10}$$

$$\text{Slope of } L = \frac{9}{10} \quad \text{because } L \parallel M.$$

$$y - (-1) = \frac{9}{10}(x - 1) \rightarrow \text{point-slope}$$

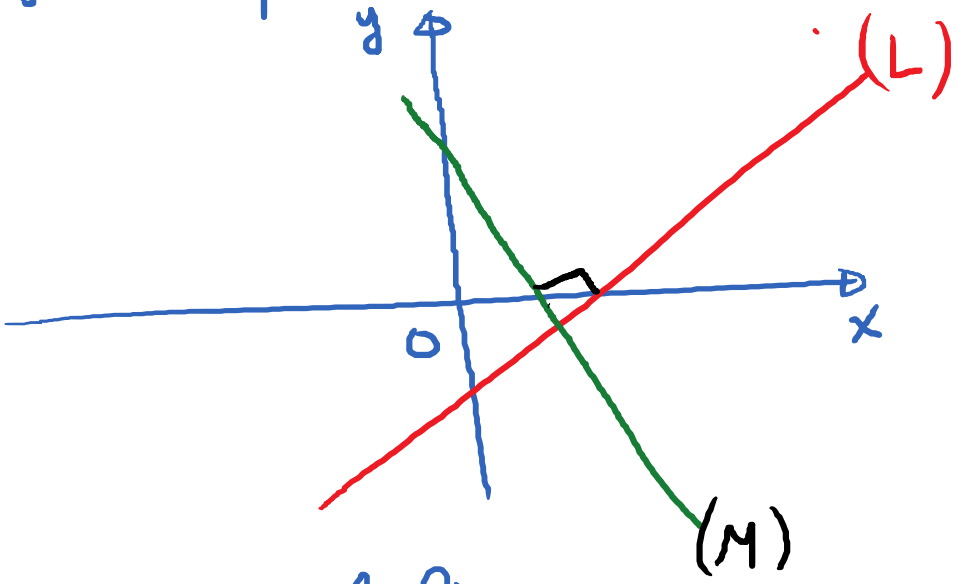
$$y + 1 = \frac{9}{10}x - \frac{9}{10}$$

$$y = \frac{9}{10}x - \frac{9}{10} - 1$$

$$\boxed{y = \frac{9}{10}x - \frac{19}{10}}$$ Slope-intercept

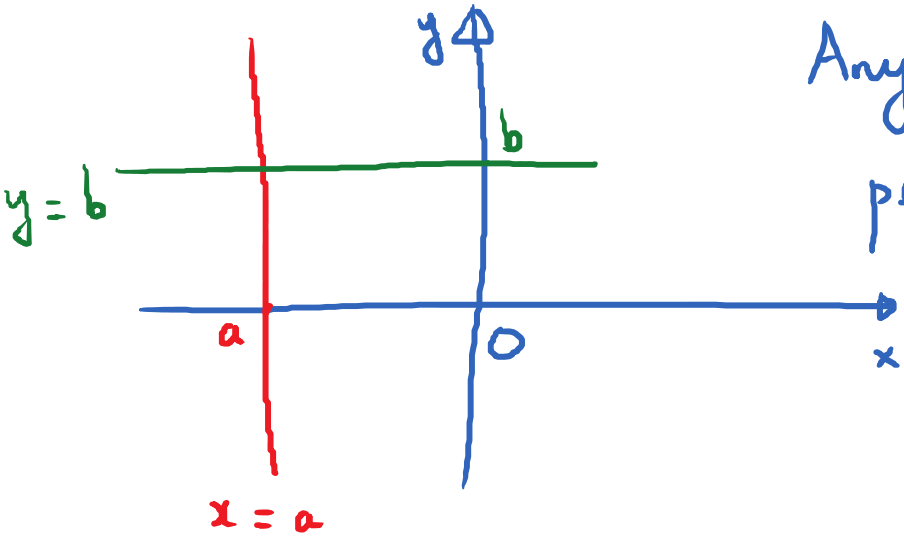

0
10
10

Obj 2: Perpendicular Lines.



For nonvertical lines:

Two lines are perpendicular if and only if the slope of one line equals the negative reciprocal of the slope of the other line.



Any horizontal line is perpendicular to any vertical line

E.g. Given the line $4x + 7y - 6 = 0$

Find the slope of any line perpendicular to the given line.

$$4x + 7y - 6 = 0$$

Goal: get y by itself then find slope.

$$7y - 6 = -4x$$

$$7y = -4x + 6$$

$$y = -\frac{4}{7}x + \frac{6}{7}.$$

Slope of given line is $-\frac{4}{7}$.

Slope of any line perpendicular to this line is

$$\boxed{\frac{7}{4}}$$

Ex. Point $(-5, -8)$.

Find the point-slope and slope intercept equation of the line that passes through $(-5, -8)$ and perpendicular to the line with general equation

$$x - 2y - 3 = 0$$

Sol:

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

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

Perpendicular line has slope -2.

Point-Slope $y - (-8) = -2(x - (-5))$

$$y + 8 = -2(x + 5)$$

$$= -2x - 10$$

$$y$$

$$\boxed{y = -2x - 18}$$