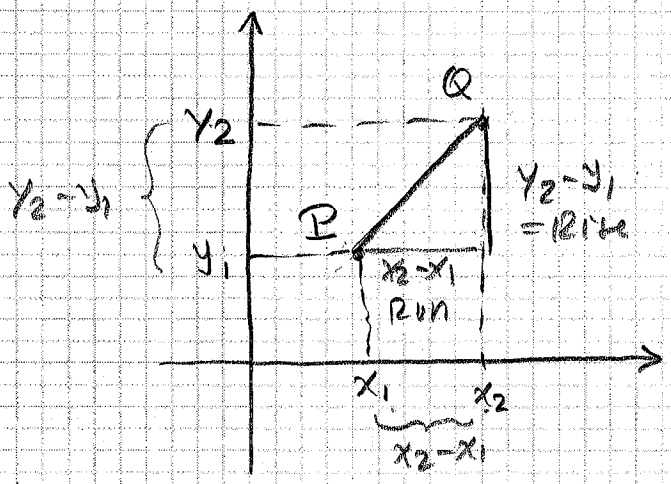
GRAPHS OF STRAIGHT LINES

$P = (x_1, y_1)$

$Q = (x_2, y_2)$

$$\text{slope} = \boxed{\frac{y_2 - y_1}{x_2 - x_1} = m} = \frac{\text{Rise}}{\text{Run}}$$

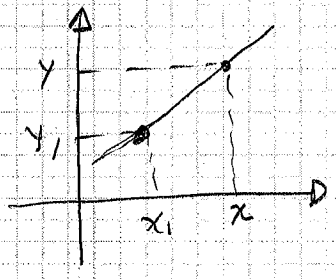


Equation of a Line containing the point (x_1, y_1) and slope m

$$\frac{y - y_1}{x - x_1} = m \Rightarrow$$

$$\Rightarrow \boxed{y - y_1 = m(x - x_1)}$$

Point-slope form



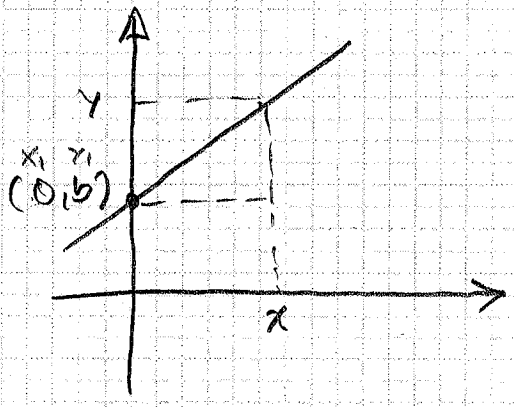
Equation of a Line having slope m and y-intercept b

$$y - b = m(x - 0)$$

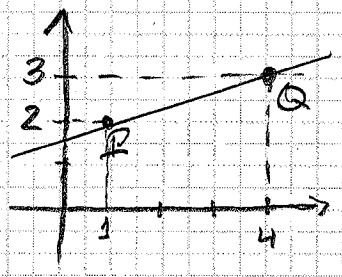
$$y - b = mx$$

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

slope-intercept form



Ex: Find the slopes and the slope-intercept form of the equations of the following lines

a) 

$P = (1,2)$ $Q = (4,3)$
$x_1\ y_1$ $x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3-2}{4-1} = \frac{1}{3}$$

$y = mx + b$

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

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

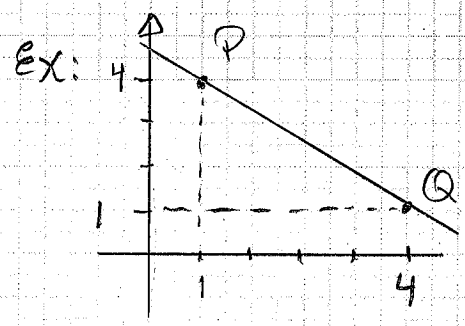
$y - 2 = \frac{1}{3}x - \frac{1}{3}$

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

$$\frac{-1}{3} + \frac{2}{1} = \frac{-1+6}{3} = \frac{5}{3}$$

l.c.m.

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

Ex: 

$P = (1,4)$ $Q = (4,1)$
$x_1\ y_1$ $x_2\ y_2$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1-4}{4-1} = \frac{-3}{3} = -1$$

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

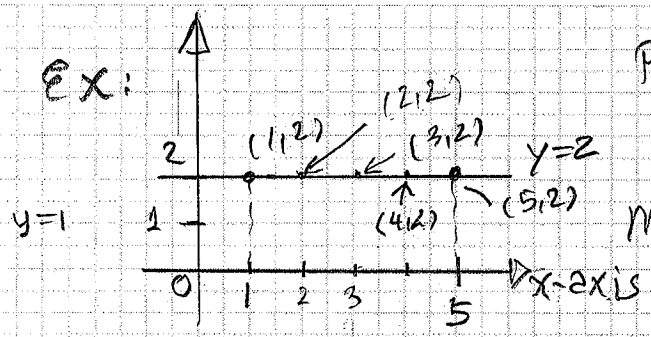
$y - 4 = -1(x - 1)$

$y - 4 = -x + 1$

$y = -x + 1 + 4$

$$\boxed{y = -x + 5}$$

Ex:



what is the equation of the x-axis? $y=0$

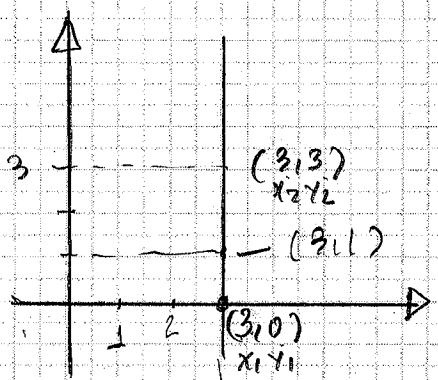
$P=(1,2)$ $Q=(5,2)$
$x_1\ y_1$ $x_2\ y_2$

$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{2-2}{5-1}=\frac{0}{4}=0$$

$$y-y_1=m(x-x_1)$$
$$y-2=0(x-1)$$
$$y-2=0$$
$$\boxed{y=2}$$

$y=mx+b$

Ex:



$\boxed{x=3}$

$$m=\frac{y_2-y_1}{x_2-x_1}=\frac{3-0}{3-3}=\frac{3}{0}$$

m is undefined

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

what is the equation of the y-axis? $x=0$

Ex: Find the slope and y-intercept of the line with equation:

$4x + 2y = 6$ ⟶ $y = mx + b$

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

$2y = -4x + 6$

$y = (-2)x(+3)$ $\quad m = -2$ $\quad$ y-intercept $= 3$