

## Equations of the Line

### Slope

Given two points  $(x_1, y_1)$  and  $(x_2, y_2)$  we find the slope of the line passing through the two points by the equation,

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

### Point-Slope Form

The Point-Slope Form of the equation of the line passing through the points  $(x_1, y_1)$  and  $(x_2, y_2)$  is given by,

$$y - y_1 = m(x - x_1) \text{ or } y - y_2 = m(x - x_2)$$

### Slope-Intercept Form

The Slope-Intercept Form of the equation of the line with a slope of  $m$  and  $y$ -intercept of  $b$  is,

$$y = mx + b$$

### Standard Form

The Standard Form of the equation of the line is given by

$$Ax + By = C \text{ or } Ax + By + C = 0$$

Where  $A$ ,  $B$  and  $C$  are integers and  $A$  is non-negative.

**Example:** Find the slope of the line passing through the points  $(1,1)$  and  $(2,3)$ . Find each form of the line passing through the two points.

We have  $m = \frac{3-1}{2-1} = \frac{2}{1} = 2$ . So that the Point-Slope Form is  $y - 1 = 2(x - 1)$ .

Solving for  $y$  we get,

$$y - 1 = 2(x - 1)$$

$$y = 2(x - 1) + 1 = 2x - 2 + 1 = 2x - 1$$

so that the Slope Intercept Form is  $y = 2x - 1$ .

Finally,  $y = 2x - 1 \Rightarrow -2x + y = -1 \Rightarrow 2x - y = 1$  so that the Standard Form is  $2x - y = 1$ .