

# QMS 130: Equation of a Line

## SLOPES, INTERCEPTS, PARALLEL, & PERPENDICULAR LINES

### Slope

A value that describes the steepness and direction of a line. The slope of a straight line between two points, let's say,  $(x_1, y_1)$  and  $(x_2, y_2)$  can be determined by finding the difference between the coordinates of the points. The slope is usually represented by the letter 'm'.

The formula for finding the slope of a line is:

Theoretically ->  $\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x}$

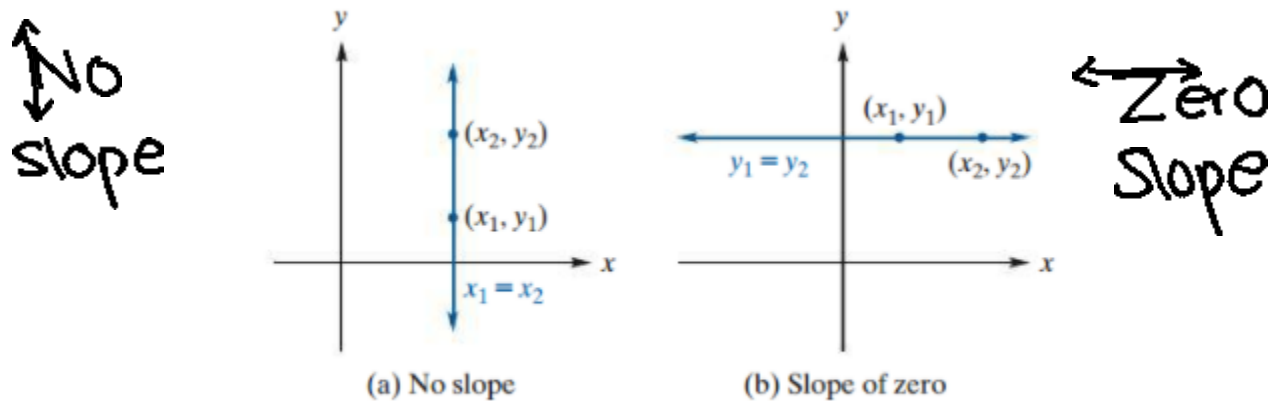
$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

Mathematically ->

where two points on the line are

$(x_1, y_1)$  and  $(x_2, y_2)$

A key point to remember is that when you have a vertical line, there is no slope. While a horizontal line has zero slope. Here's a quick trick to remember this.



**FIGURE 3.3** Vertical and horizontal lines.

# QMS 130: Equation of a Line

## SLOPES, INTERCEPTS, PARALLEL, & PERPENDICULAR LINES

### Equation of a Line

Once you find the slope of the line, you have to form an equation of the line. There are 2 equations used to find the equation of a line.

#### Point-Slope Form

This formula is used to find the equation of a line when there is no y-intercept given. Therefore, you might just be given one point on the line and the slope of the line.

As a reminder, the y-intercept is the point on the graph where the line crosses the y-axis. This coordinate is expressed as (0,b)

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

*is a point-slope form of an equation of the line through  $(x_1, y_1)$  with slope  $m$ .*

#### Slope-Intercept Form

This formula is used when you are given the slope as well as the y-intercept.

$$y = mx + b$$

*is the slope-intercept form of an equation of the line with slope  $m$  and y-intercept  $b$ .*

### Parallel Lines

Two lines are parallel if and only if they have the same slope or are both vertical. Therefore, if given two equations in the  $y = mx + b$  form, if they have the same ' $m$ ' they are parallel lines.

Here is an example of two parallel line equations.

$$y = 2x + 3$$

$$y = 2x - 1$$

They both have the same slope of **2**.

# QMS 130: Equation of a Line

## SLOPES, INTERCEPTS, PARALLEL, & PERPENDICULAR LINES

### Perpendicular Lines

Perpendicular lines are two lines that intersect each other at a 90 degree angle. Two lines are perpendicular if and only if their slopes multiply to give -1.

Here is an example of two perpendicular line equations.

$$y = -2x + 3$$

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

By multiplying the two slopes,  $-2 \times \frac{1}{2}$ , you get -1.