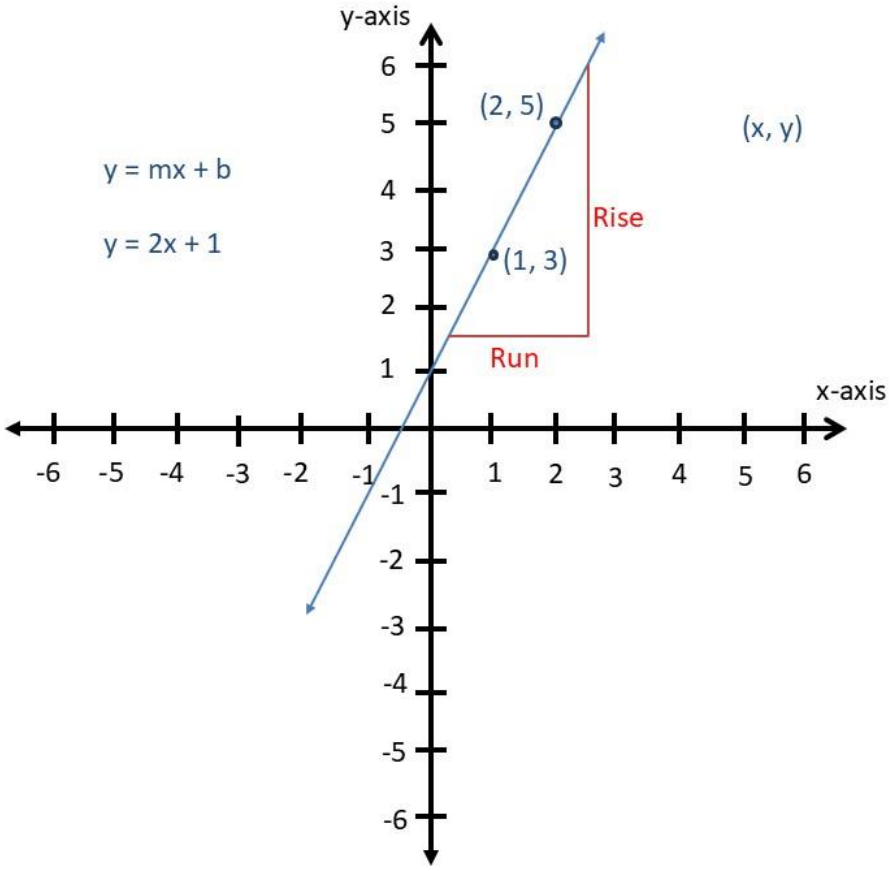
Slope of a Line

Slope of a curve and area under a curve

In Module 1 of the physics text, we study graphs for the position of an object vs time; the velocity of an object vs time; and the acceleration of an object vs time. Reviewing what you have learned about the slope of a line will be useful.



Writing the Equation of a line

Vertical lines, x = K

Horizontal lines, y = K

Where K is a constant, some number

Other lines: Use the Slope – Intercept Method

If the equation is in this form: y = mx + b

m = the slope of the line

b = the y-intercept (x=0)

Find the equation from the graph

The point where the line crosses the y-axis is **b**.

To find **m**, which is the slope:

If the line goes up from left to right, the slope is **positive**.

If the line goes down from left to right, the slope is **negative**.

Start at some point on the line. Measure how much y changes for a change in x.

$$Slope = \frac{change\ in\ y}{change\ in\ x} = \frac{rise}{run}$$

Pick two points on the line: (x_1, y_1) and (x_2, y_2)

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

Write the equation: y = mx + b

Graph using the slope-intercept method

Solve the equation for y, to get y = mx + b

$$Slope = m = \frac{change\ in\ y}{change\ in\ x} = \frac{rise}{run}$$

Plot the point (0, b)

Starting at that point

If m is **positive**, go **up** on y-axis according to the rise. Then over on the x-axis according to the run.

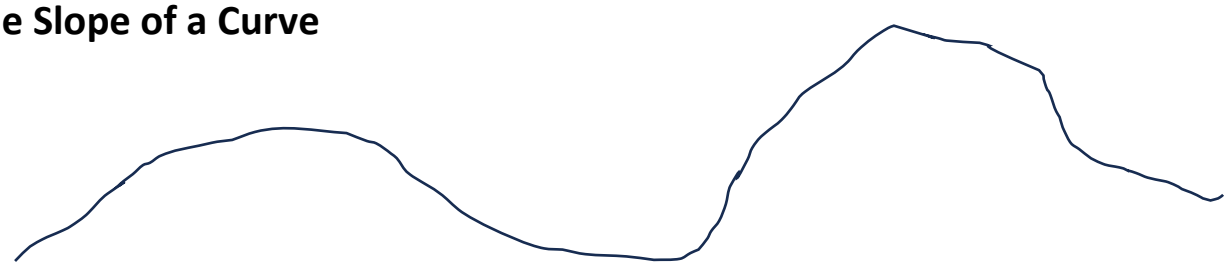
If m is **negative**, go **down** on y-axis according to the rise. Then over on the x-axis according to the run.

Plot the next point.

Draw a line through the two points.

The slope of a horizontal line is zero.

The Slope of a Curve



This curve has a continuously changing slope, whereas a straight line has a constant slope.

But we can think about the slope of this curve at a particular point on the curve.

Pick a point and think of a line tangent to the curve at that point. Then consider the slope of the line and that will be what we mean by, "the slope of the curve at that point".

The slope of the curve is zero at the point where the slope changes from positive to negative, or from negative to positive. (The tangent to the curve at that point is a horizontal line.)

If you graph position vs time for an object in motion, the slope of the curve at a certain point will be the **velocity** of that object at that point in time. (See p. 16, 19, and 20 of your physics text.)

If you graph velocity vs time for an object in motion, the slope of the curve at a certain point will be the **acceleration** of the that object at that point in time. (See p. 28 and 29 of your physics text.)

The Area under a Curve

The area under a velocity vs time curve is the displacement of an object. (See p. 29 of your physics text.)

The area under an acceleration vs time curve is the velocity of an object.

This handout is a preview of Calculus: derivatives and integrals.