IB Math SL Notes **Average Rate of Change/The Tangent Line**

Topic 6 – Day 2

1. **Rates of Change:**

Average Speed: \_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

When plotted on a graph, distance is the \_\_\_\_\_\_ variable and time is the \_\_\_\_\_ variable.

Therefore, Average speed (Rate of change between distance and time) is defined as:

This is really the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Average Velocity: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **A Bit of History:**

As was mentioned last class, Calculus was developed to describe scientific ideas. Scientists, such as Sir Isaac Newton, wanted to figure out the instantaneous velocity of an object whose velocity was always changing. Such objects had non-linear graphs, and thus, finding a “slope”, or “gradient”, was not a straightforward task.

*Information about the EPIC controversy between Isaac Newton and Gottfried Leibniz:*

[*http://www.youtube.com/watch?v=axZTv5YJssA&feature=related*](http://www.youtube.com/watch?v=axZTv5YJssA&feature=related)

[*http://www.uh.edu/engines/epi1375.htm*](http://www.uh.edu/engines/epi1375.htm)

  VS

*Newton Leibniz*

1. **The Secant Line**

Consider the following curve:

The gradient of the secant line PQ is written as:

**Ex:** Write an expression for the gradient of the secant function for f(x) = 3x2.

1. **The Tangent Line/Derivative**

Consider what happens as we slide point Q closer to point P:

The gradient of the TANGENT line at point P is written as:

This is also known as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Notation for this is: \_\_\_\_\_ or \_\_\_\_\_\_.

**Ex 2:** Find the derivative of f(x) = 3x2 and hence find the gradient of the tangent line when x = 4.

**Ex 3:** Find the derivative of f(x) = x + 7 and hence find the gradient of the tangent line when x = -2.

**Ex 4:** Find the derivative of f(x) = x2 – 1 and hence find the gradient of the tangent line when x = 3.