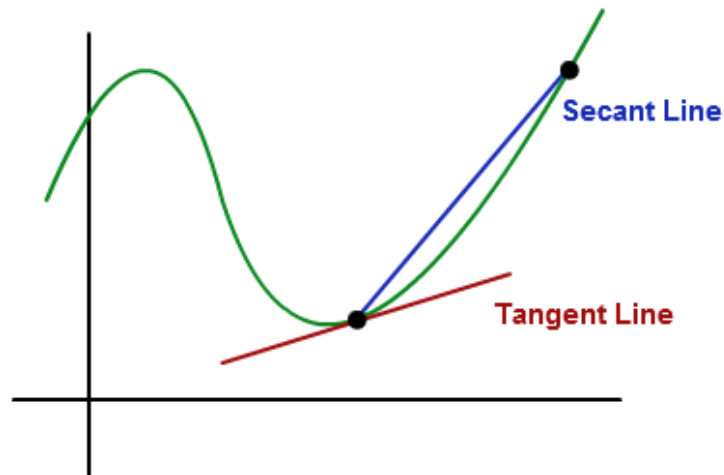# MAT 21A - Lecture 3

Limits & Continuity

The following function can be used to find the average rate of change between two points of a function, (x_1, x_2):

$$\frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

The average rate of change can be represented as a secant line between two points on a graph.

To find an instant rate of change, another formula must be used:

$$\frac{f(x_1 + h) - f(x_1)}{h} \quad \text{where} \quad h = x_2 - x_1$$

You can note that the above function, although slightly less intuitive, is actually more or less equal to the previous function:

$$\frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

What is interesting, is you use algebra to distill the function down to a much simpler equation, that usually looks like:

$$h - 2$$

Where -2 could be any value. Thus, we can see how a limit represents h approaching 0:

$$\lim_{h \to 0} f(x) = -2$$

This would leave us with the following, -2, as an instant rate of change at a given point.

The point slope formula can also be used to create an equation including the slope of a point from a graph: $y - k = m(x - h)$ where $P(h, k)$.