Derivatives

A *derivative* (slope of a line) is measuring the sensitivity of a function's output with respect to it's input. In other words, it measures the *steepness* of the graph of a function.

If we have a linear function like below where for every input x it returns a y value of 3 times the value of x:

$f(x) = 3x$

If we have a point where $x = 2$ then $y = 6$

$f(2) = 3 \cdot 2 = 6$

Therefore, our first point is at:

$(2, 6)$

If we say $x = 6.001$, then:

$f(6.001) = 3 \cdot 6.001 = 18.003$

Therefore, our second point is at:

$(6.001, 18.003)$

If we want to know what the derivative is we take the change in y and divide by the change in x:

$\frac{\Delta y}{\Delta x} = \frac{6.001 - 2}{18.003 - 6} = \frac{4.001}{12.003} = .\overline{33}$

Therefore, we say the *derivative with respect to $f(x)$* is $.\overline{33}$.

$\frac{\partial f(x)}{\partial x} = .\overline{33}$

Or, more precisely, we would use the delta δ term which says: The delta (or rate of change), which is the derivative with respect to our function $f(x)$ is $.\overline{33}$.

$\delta = \frac{\partial f(x)}{\partial x} = .\overline{33}$

Derivatives and Quadratics

For getting the derivative of a quadratic function we will need to calculate it with respect to the tangent line as shown below.