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 of our function* $f(x)$ *with respect to* x is $.\overline{33}$.

> $\frac{df(x)}{dx} =.\overline{33}$

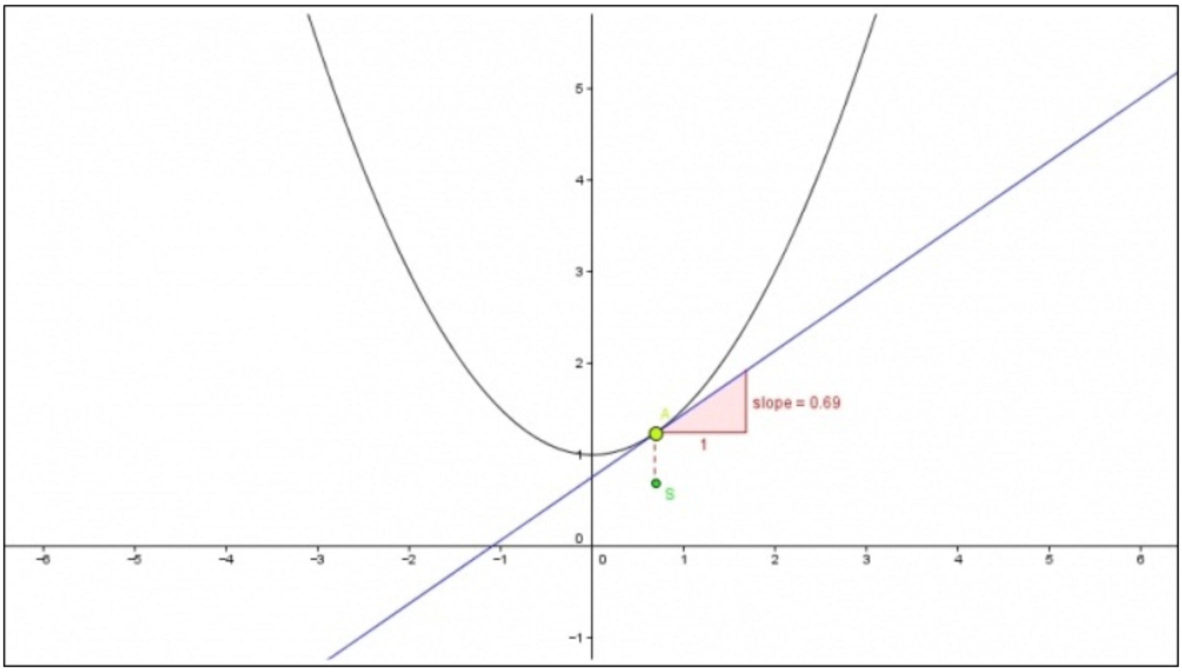
Or, more precisely, we would use the delta δ term which says: The delta (or rate of change), which is the derivative for the function $f(x)$ with respect to x is $.\overline{33}$.

> $\delta = \frac{df(x)}{dx} =.\overline{33}$

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. Also, since quadratics are complex function and don't yield a simple straight line we only know the partial derivative ∂ at any given point since it is constantly changing.

> $\frac{\partial f(x)}{\partial x}$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