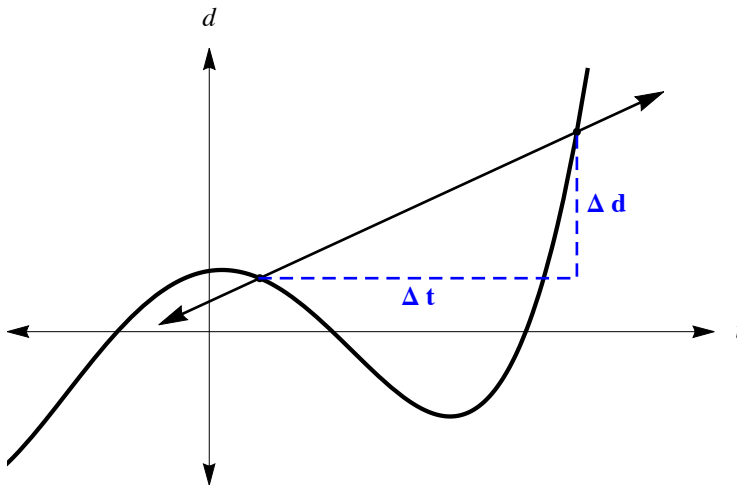


## Average Rate of Change (AROC)

As we have seen, the average velocity of any object, between any two given points in time, is given by the equation:

$$v_{\text{avg}} = \frac{\Delta d}{\Delta t} = \frac{\text{change in distance}}{\text{change in time}}$$

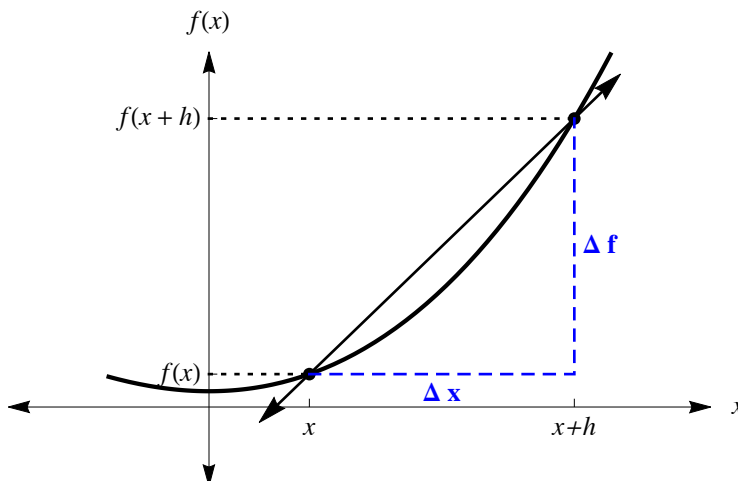
If we were to plot a graph of distance versus time, then it becomes really clear that the average velocity is the slope of a secant line that intersects those two points in time:



Velocity, of course, is the average rate of change of distance. There are a lot of circumstances that involve rate of change, here are a few examples:

- Filling a gas tank (gallons per minute)
- Draining a pool (gallons per hour)
- Reading (words per minute)
- Spin (rotations per second)
- Heating and cooling (degrees per hour)

Since the slope of the secant line gives us the *Average Rate of Change* (AROC) for any quantity that is a function of time, we can “Generalize” and derive the general equation for Average Rate of Change. Let’s start with a detailed graph:



Using our definition for the slope of a line, we can write the AROC equation:

$$\text{AROC} = m = \frac{\text{rise}}{\text{run}} = \frac{\Delta f}{\Delta x} = \frac{f(x+h) - f(x)}{(x+h) - x} = \frac{f(x+h) - f(x)}{h}$$