Average ~~Speed~~ Velocity

Definition. Average ~~speed~~ velocity *is defined to be* change ~~in~~ distance (displacement) **divided by change in time.**

Speed = | velocity |

Velocity is affected by direction.

$$\frac{f(t_{i+1}) - f(t_i)}{t_{i+1} - t_i} = \frac{d_{i+1} - d_i}{t_{i+1} - t_i}$$

Derived Table of Speeds and Accelerations

$$[t, t + 0.1]$$

t_i t_{i+1}

velocity

time (s)	distance (m)	~~speed~~ (m/s)	acc (m/s/s)
0.10	0.049	1.470000	9.800000
0.20	0.196	2.450000	9.800000
0.30	0.441	3.430000	9.800000
0.40	0.784	4.410000	9.800000
0.50	1.225	5.390000	9.800000
0.60	1.764	6.370000	9.800000
0.70	2.401	7.350000	9.800000
0.80	3.136	8.330000	9.800000
0.90	3.969	9.310000	9.800000
1.00	4.900	10.290000	9.800000

The Meaning of Constant Acceleration

Suppose the speed of a falling object is given by the function $v(t)$. Then the average acceleration over the interval $[t, t+h]$ is given by the quotient

$$\frac{v(t+h) - v(t)}{h}.$$

t_{in} t_i — $t_{in} - t_i$

← regular time steps or for one sample

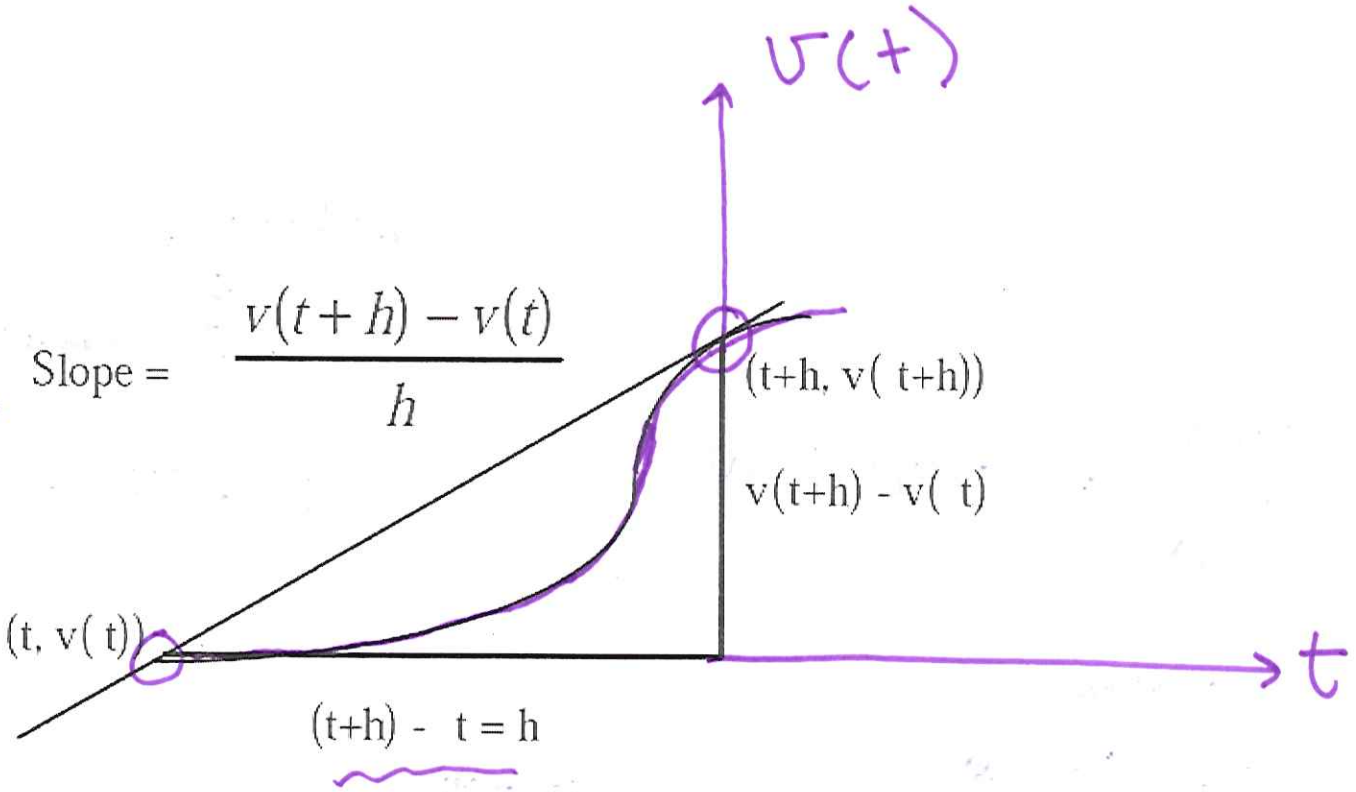
We call this quotient the *difference quotient.*

so $h = t_{i+1} - t_i$

↑ sometimes Δt

↑ "change"

avg acc = $\frac{\text{rise}}{\text{run}}$



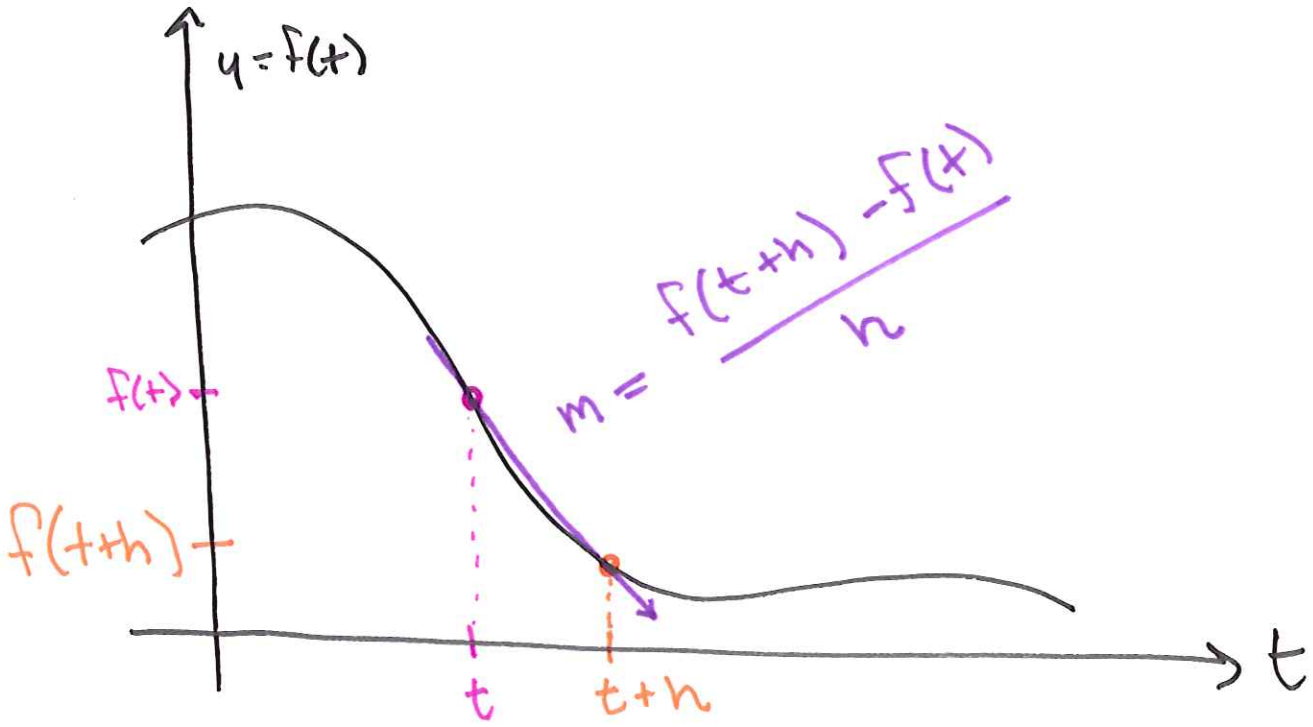
$$\frac{\text{rise}:\ v(t+h)-v(t)}{\text{run}:\ (t+h)-t} = \text{slope}.$$

Defn

$f(t)$

The difference quotient of $f(t)$ over a time interval h is

$$\frac{f(t+h) - f(t)}{h}$$



e^t was the exp fn which has slope 1 @ $t=0$.