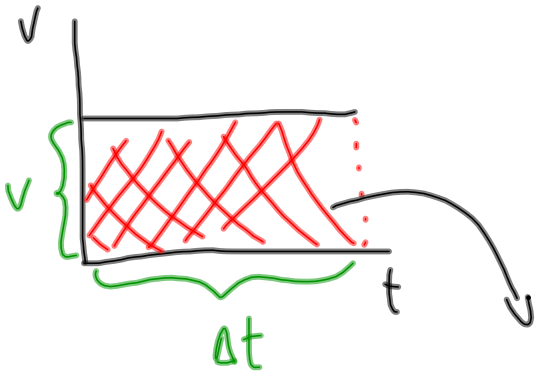
# Acceleration + Displacement

How can we find displacement for an object that is accelerating?

Consider an object moving with constant velocity:



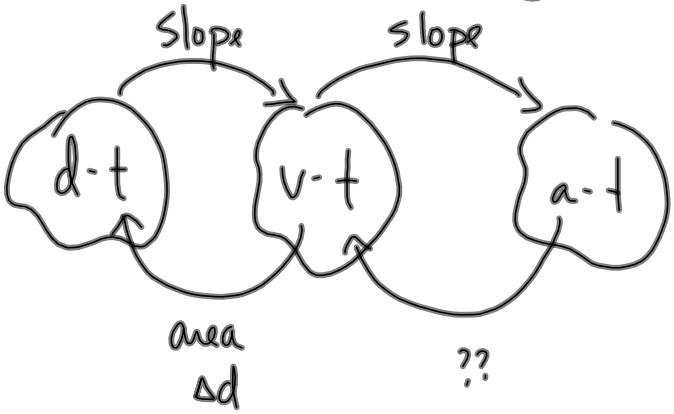

We can use: $V = \frac{\Delta d}{\Delta t}$

area of rectangle = l x w

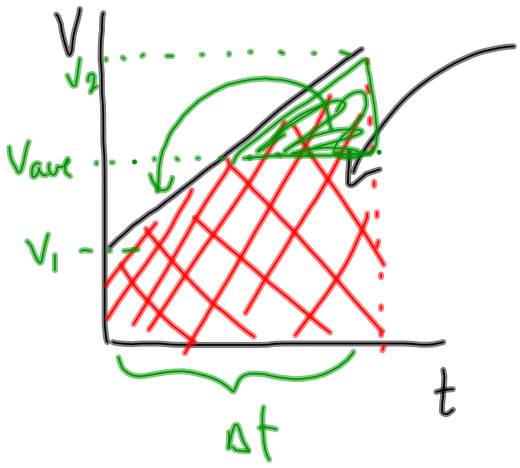
area (v-t) = $v \Delta t$

and we know $\Delta d = v \Delta t$ (from $V = \frac{\Delta d}{\Delta t}$)

so area v-t graph = $\Delta d$



Consider an object with constant acceleration:



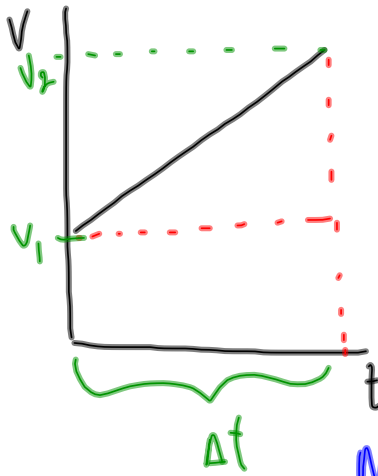

area of a trapezoid $= \frac{1}{2}(h_1 + h_2)\,b$

$$\Delta d = \frac{1}{2}(v_1 + v_2)\,\Delta t$$

$$\Delta d = \left(\frac{v_1 + v_2}{2}\right)\Delta t \qquad (v_{ave})$$

really just ($v_{ave} = \frac{\Delta d}{\Delta t}$)

$$\Delta d = v_{ave}\,\Delta t$$




area of trapezoid = ▭ + ◺

Maybe Useful Equations

$$\Delta d = v_1 \Delta t + \frac{1}{2} a (\Delta t)^2$$

$$\Delta d = v_2 \Delta t - \frac{1}{2} a (\Delta t)^2$$

$$v_2^2 = v_1^2 + 2a\Delta d$$

# Kinematics Equations

Constant Velocity: $v = \frac{\Delta d}{\Delta t}$

Constant Acceleration: $v_{ave} = \frac{\Delta d}{\Delta t}$ where $v_{ave} = \frac{v_1 + v_2}{2}$

$a = \frac{\Delta v}{\Delta t}$ where $\Delta v = v_2 - v_1$

May be Useful Equations

① $\Delta d = v_1 \Delta t + \frac{1}{2} a (\Delta t)^2$

② $\Delta d = v_2 \Delta t - \frac{1}{2} a (\Delta t)^2$

③ $v_2^2 = v_1^2 + 2a\Delta d$

In any acceleration problem, there are 5 variables:

$\Delta d, \Delta t, v_1, v_2, a$

If you know any 3 of these, you can find the other 2.