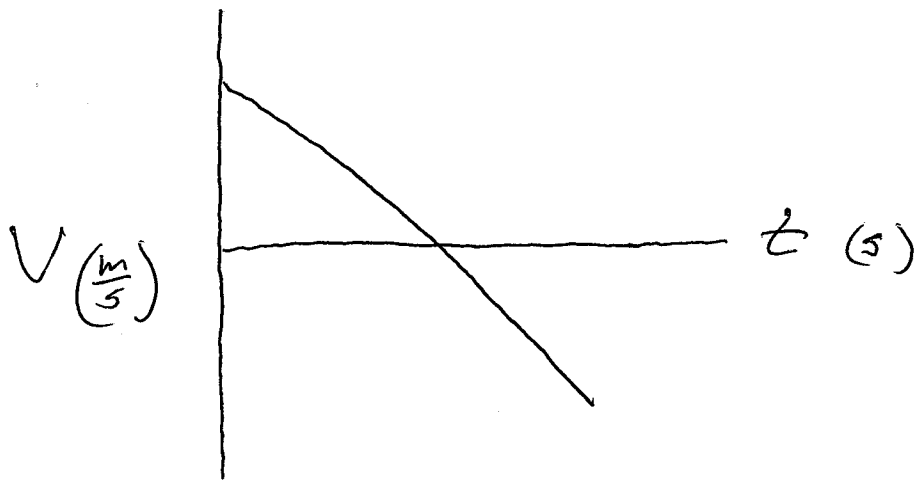


Interpreting Graphical Information



on any graph you have 3 pieces of information:

1) Reading the points

In this case velocity and time

2) Slope

In this case

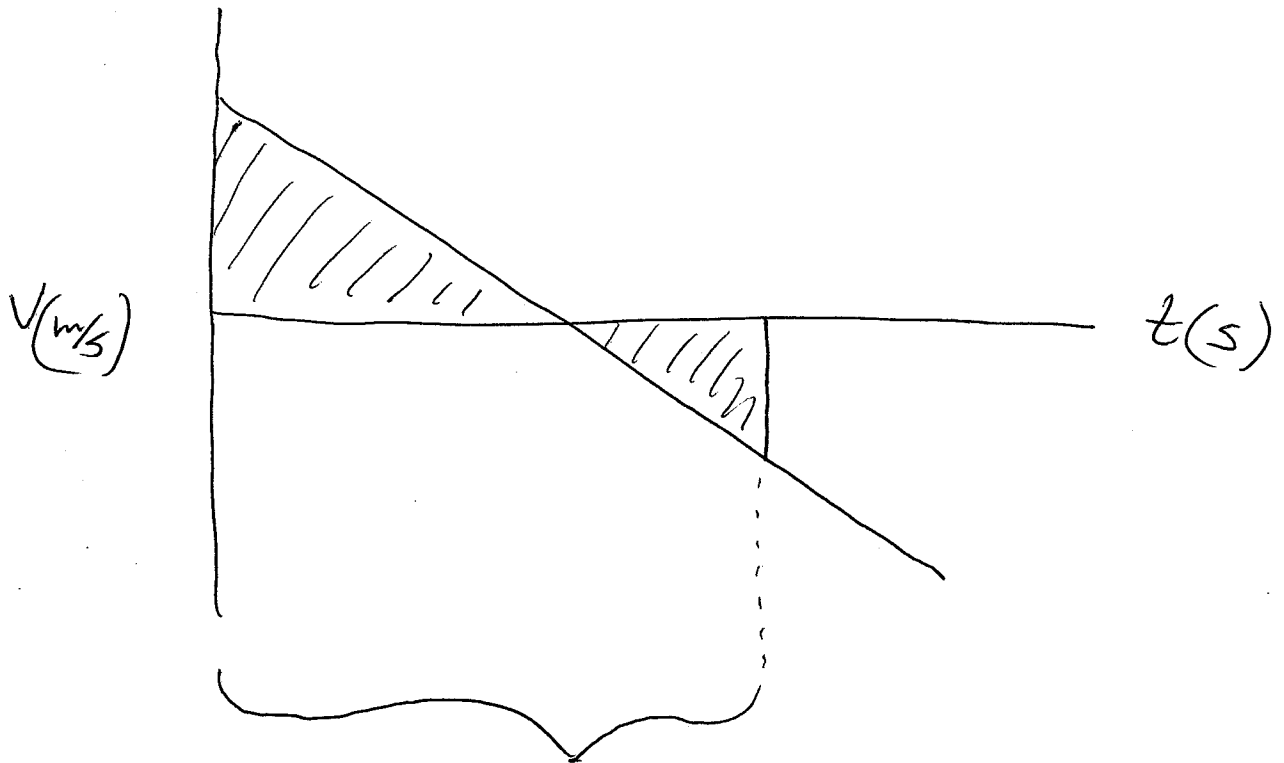
$$a = \frac{\Delta V}{\Delta t} \quad \text{unit analysis} \quad \frac{\text{m/s}}{\text{s}}$$

$\frac{\text{m}}{\text{s}^2}$ ↗

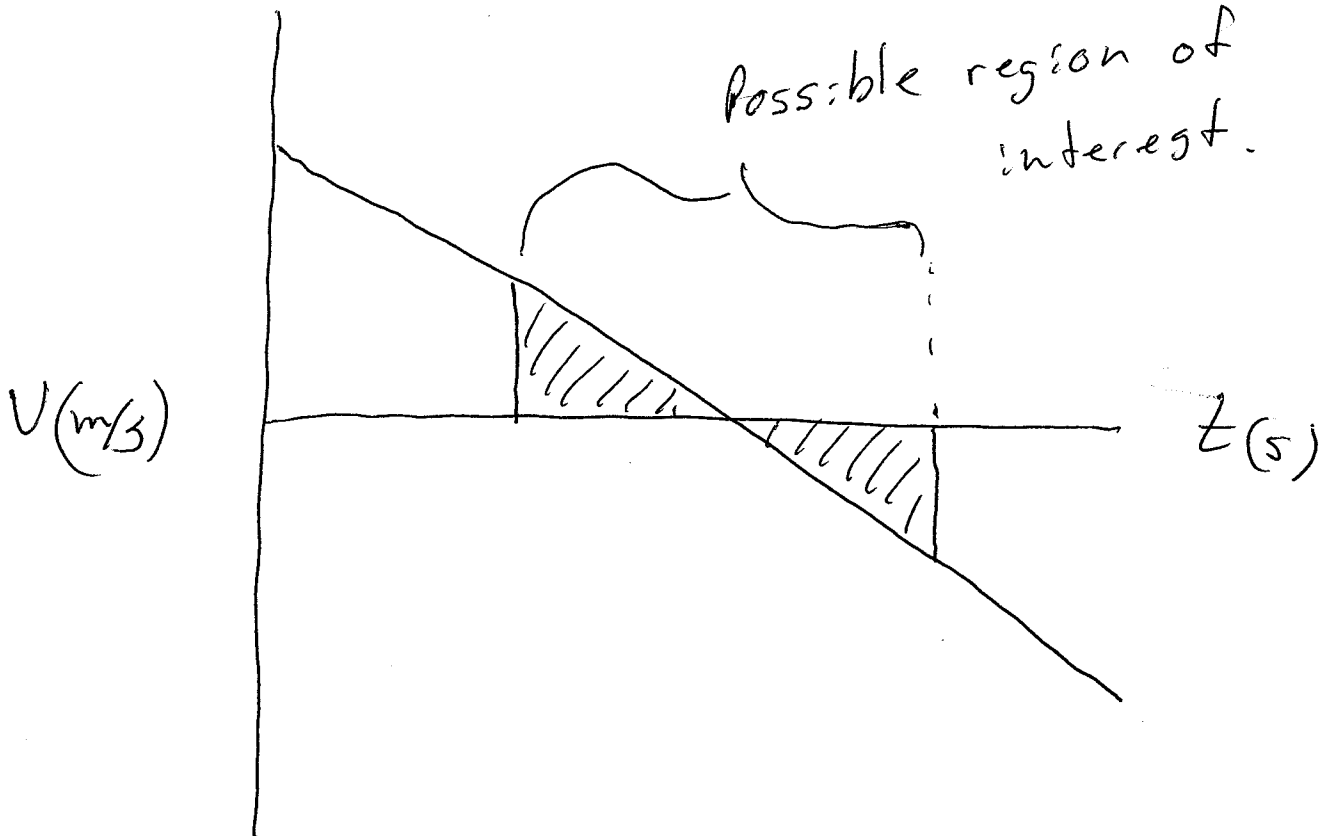
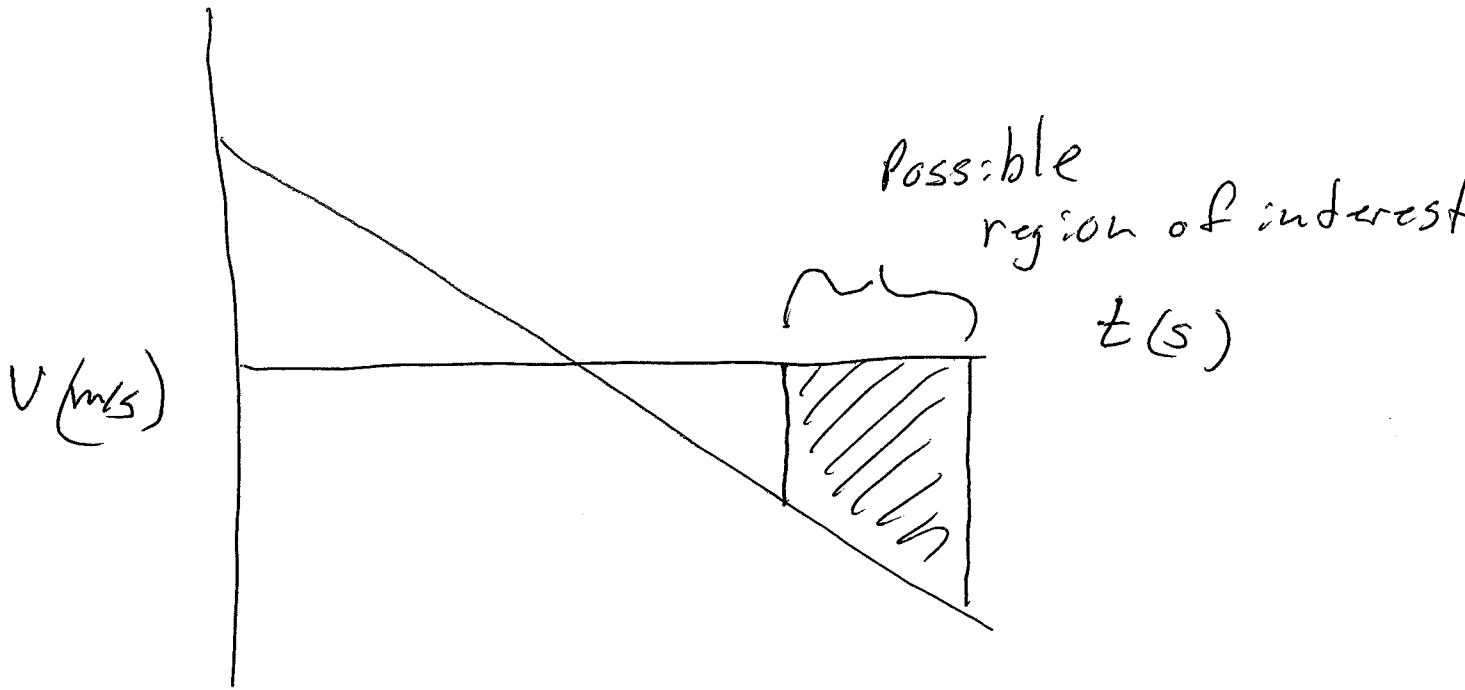
Identify by form or unit ↗

3) Area

* The "area" is the region bounded by the curve/line and the horizontal axis.



Possible region of interest



In this case we have two possible general area equations

$$A = \frac{1}{2}bh \quad \text{triangular}$$

or

$$A = \frac{1}{2}bh + bh \quad \text{triangular + rectangular}$$

Unit analysis

$$A = \frac{1}{2}bh \quad (\cancel{s}) \left(\frac{m}{\cancel{s}} \right) = \underline{\underline{m}}$$

$$A = \frac{1}{2}bh + bh$$



$$(\cancel{s}) \left(\frac{m}{\cancel{s}} \right) + \cancel{s} \left(\frac{m}{\cancel{s}} \right)$$

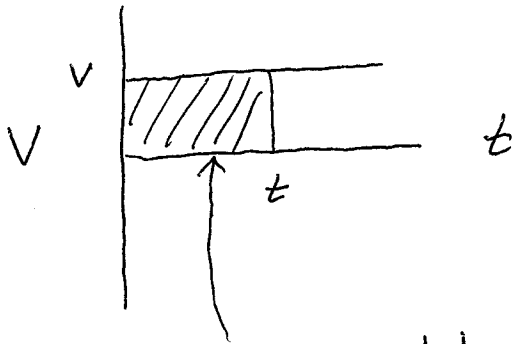
$$m + m = \underline{\underline{m}}$$

* Constants do not affect unit analysis!

~~Answer~~

Motion and the Equations that Describe it,

Standard Model 1: Constant velocity (nonzero)



$$\text{Area} = bh = vt$$

Unit analysis

$$\cancel{\text{s}} \left(\frac{\text{m}}{\cancel{\text{s}}} \right) = \text{m}$$

Area = position change = Δx

$$\Delta x = vt$$

$$\Delta x = x - x_i$$

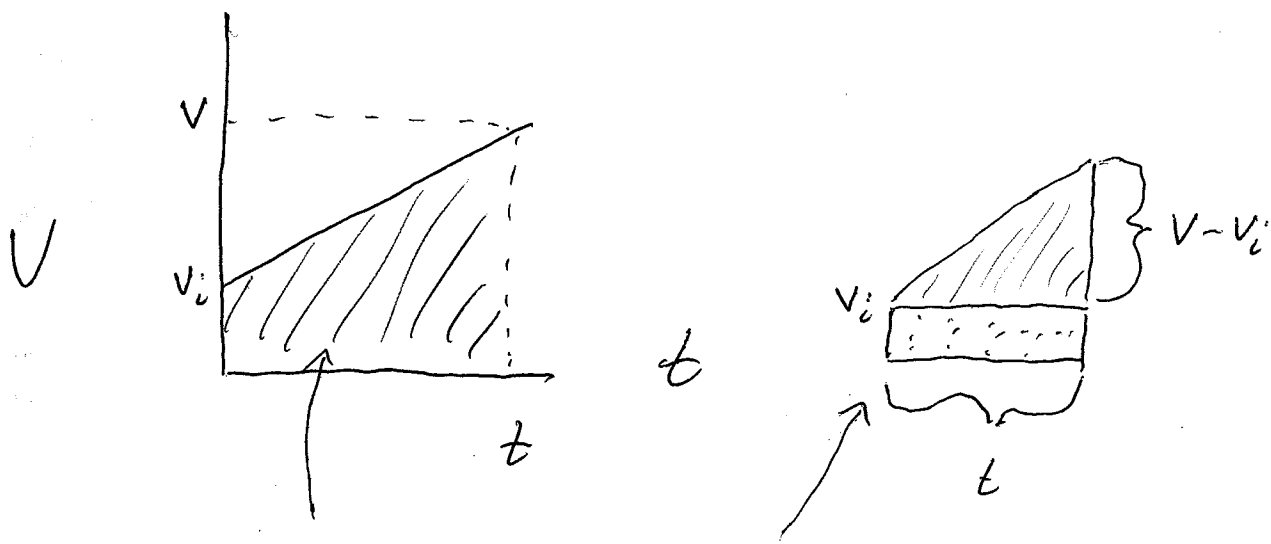
Equation Set

$$x = vt + x_i$$

$$v = \text{constant}$$

$$a = 0$$

Standard Model 2: Constant Acceleration (nonzero)



$$\text{Area} = \frac{1}{2} b h_1 + b h_2$$

$$= \frac{1}{2} t (v - v_i) + t v_i$$

$$= \frac{1}{2} t \Delta v + t v_i$$

unit analysis

$$\int \left(\frac{m}{s} \right) + \int \left(\frac{m}{s} \right)$$

$$m + m = m$$

$$\text{Area} = \Delta x$$

$$\Delta x = \frac{1}{2} \Delta v t + v_i t$$

$$x = \frac{1}{2} \Delta v t + v_i t + x_i$$

Since v_{ost} is linear it fits the general model

$$y = mx + b$$

↓ ↓ ↓ ↓

$$v = \left(\frac{\Delta v}{\Delta t} \right) t + v_i \qquad v = at + v_i$$

↓

a

$$\Delta v = \left(\frac{\Delta v}{\Delta t} \right) (t) = at$$

$$x = \frac{1}{2} (at) t + v_i t + x_i$$

Equation set

$$x = \frac{1}{2} at^2 + v_i t + x_i$$

$$v = at + v_i$$

$$a = \text{constant}$$