Reminders 07-09-09:

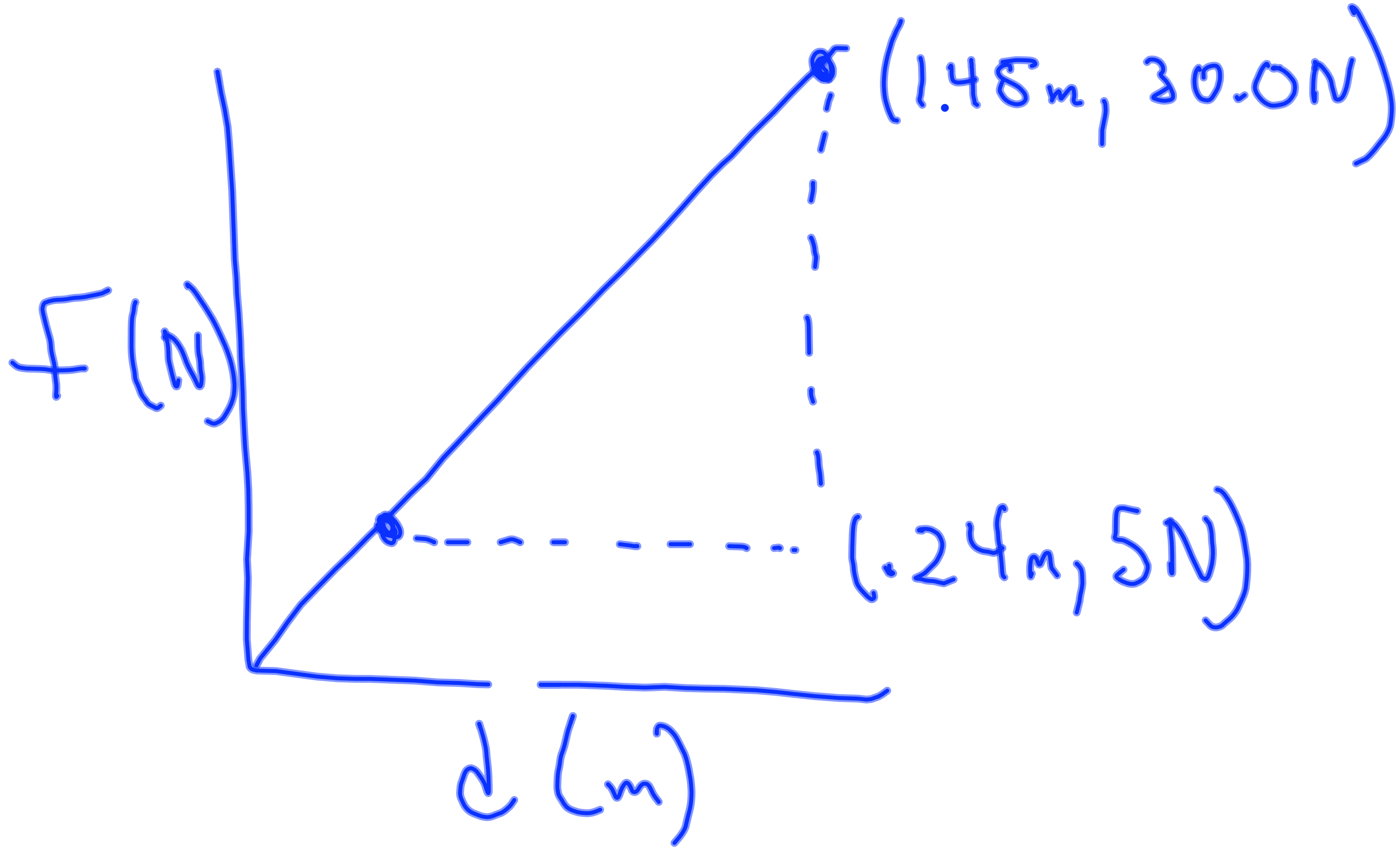
- 1st Webassign due Tonight 11:59PM
- Turn in Problems 9 and 12 Monday
- 2nd Webassign Ch 2&3 due Tues. 11:59PM
- ***Exam 1 Chapters 1-3 Wednesday July 15.***
- ***Print Out Sample Exams From Our Website***

(focus on problems 1-4 Exam 1 F01; problems 1,3,&4 Exam 2 F01; problem 1-6 Exam 1 S00; problems 1,3, & 4 Exam 2 S00.

- Purchase "AMPAD" paper.
- Need Scientific Calculator for Exams

Objectives:

- One Dimensional Motion
- Examples



$$\frac{(30-5)}{1.45-.24} = \frac{25}{1.21}$$

A 07-09-09

1.0e20

1.0E20

16a

$$\rho = \frac{m_{TOTAL}}{V_{TOTAL}} = \frac{m_1 + m_2 + m_3}{V_1 + V_2 + V_3}$$

$m_1 = \frac{1}{2} m_{TOTAL}$

$m_2 = .167 m_{TOTAL}$

$m_3 = .333 m_{TOTAL}$

$m_1 + m_2 + m_3 = m_{TOTAL}$

$$V = \frac{m}{\rho}$$

$$V_1 = \frac{m_1}{\rho_1} = \frac{\frac{1}{2} m_{TOTAL}}{2.70 \times 10^3 \, kg/m^3}$$

$$V_2 = \frac{m_2}{\rho_2} = \frac{.167 m_{TOTAL}}{7.80 \times 10^3 \, kg/m^3}$$

$$V_3 = \frac{m_3}{\rho_3} = \frac{.333 m_{TOTAL}}{11.3 \times 10^3 \, kg/m^3}$$

$$\rho = \frac{m_{TOTAL}}{\frac{\frac{1}{2} m_{TOTAL}}{2.70 \times 10^3 \frac{kg}{m^3}} + \frac{.167 m_{TOTAL}}{7.80 \times 10^3 \frac{kg}{m^3}} + \frac{.333 m_{TOTAL}}{11.3 \times 10^3 \frac{kg}{m^3}}}$$

$$= \frac{\cancel{m_{TOTAL}}}{\cancel{m_{TOTAL}} \left[\frac{\frac{1}{2}}{2.70 \times 10^3} + \frac{.167}{7.80 \times 10^3} + \frac{.333}{11.3 \times 10^3} \right]}$$

$$= \frac{1}{1.851 \times 10^{-4} + 2.1410 \times 10^{-5} + 2.946 \times 10^{-5}}$$

15e

$$\frac{2.718 - 2.72}{2.718} =$$

$$\begin{array}{r} 2.72 \\ -\ 2.718 \\ \hline \end{array}$$

- A motorcycle accelerates (to the right) from rest to 60.0 mph in 3.8s.
  - What is the magnitude of the average acceleration of the motorcycle?

$$\vec{a} = \frac{\Delta \vec{V}}{\Delta t} = \frac{V_f - V_i}{3.8\,s} = \frac{60.0\,mph - 0}{3.8\,s}$$

$$= 16\,mi/h/s \text{ to the right}$$

Convert to feet/s^2

$$\left(16 \frac{\cancel{mi}}{\cancel{h}\,s}\right)\left(\frac{5280\,ft}{\cancel{mi}}\right)\left(\frac{1\,\cancel{h}}{3600\,s}\right) = 23\,ft/s^2$$

A 07-09-09

- A car is traveling to the right at 20.0 mph. It then accelerates at a rate of 5.0 mph/s (to the right) in 10.0s.
  - What is the speed of the car after 10.0s?

$\Delta t = 10.0s$

$V_i = 20 mph$

$V_f = ?$

$a = 5.0 \ mph/s$

$$\vec{a} = \frac{\vec{V}_f - \vec{V}_i}{\Delta t} \qquad a = \frac{V_f - V_i}{\Delta t}$$

$$a \Delta t = V_f - V_i$$

$$V_f = a \Delta t + V_i$$

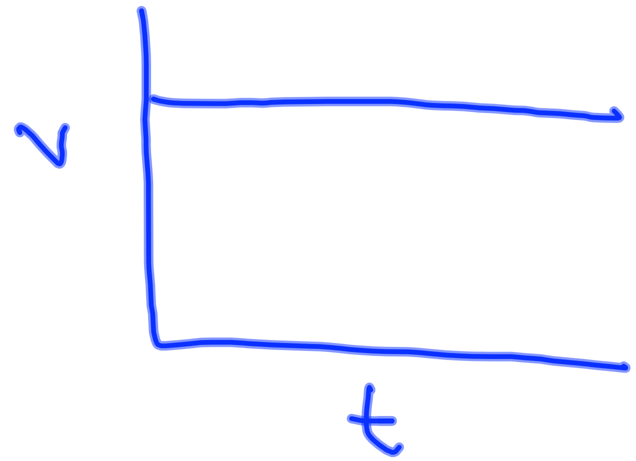
$$= (5.0 \ mph/\cancel{s})(10.0 \cancel{s}) + 20.0 \ mph$$

$$= (5.0 \times 10^1 + 2.00 \times 10^1) mph$$

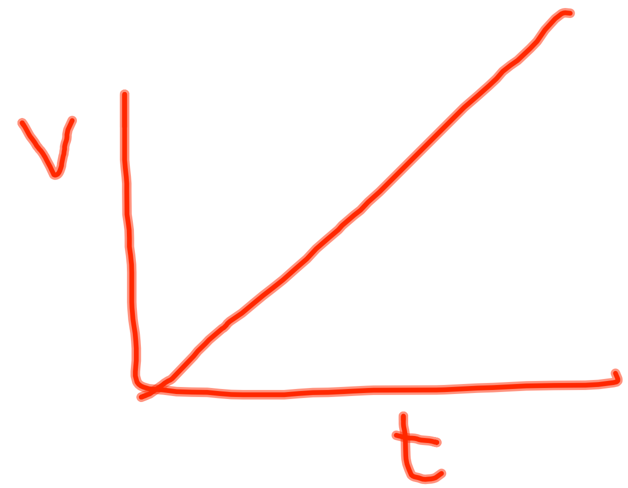
$$= (7.0 \times 10^1) mph$$

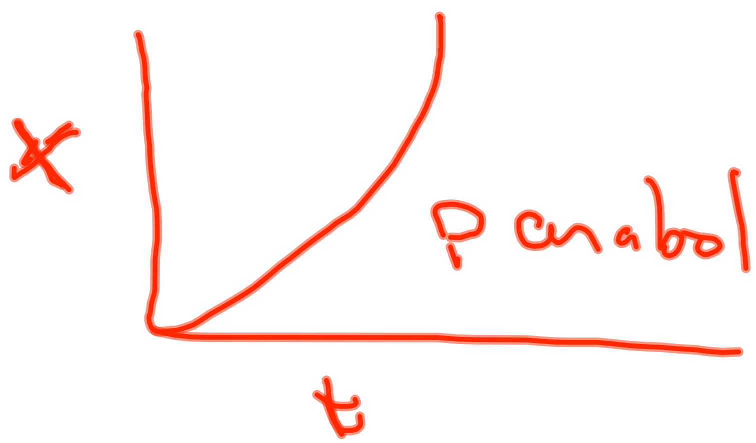
A 07-09-09

If v is constant



If a is constant



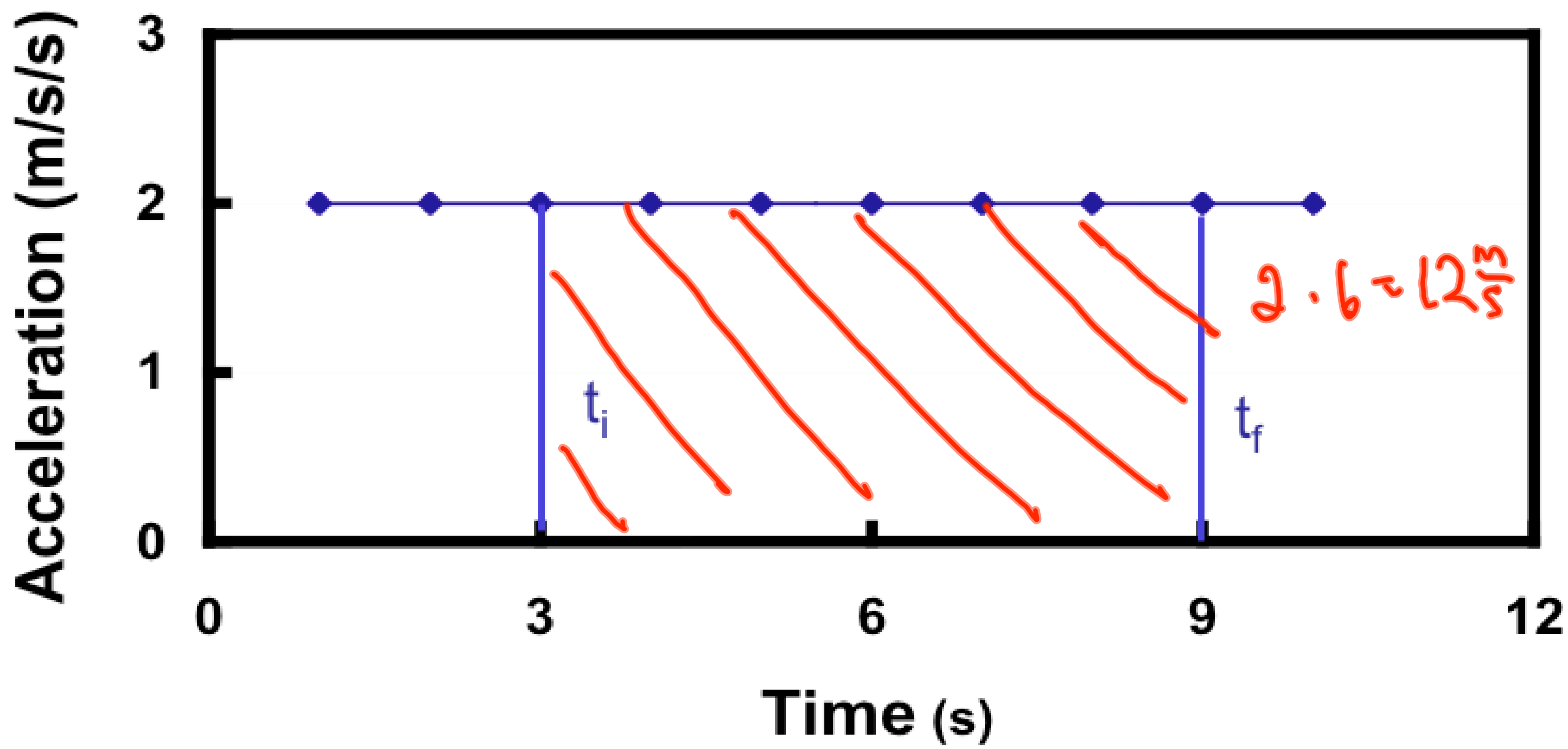


parabola depends on t^2

quadratic

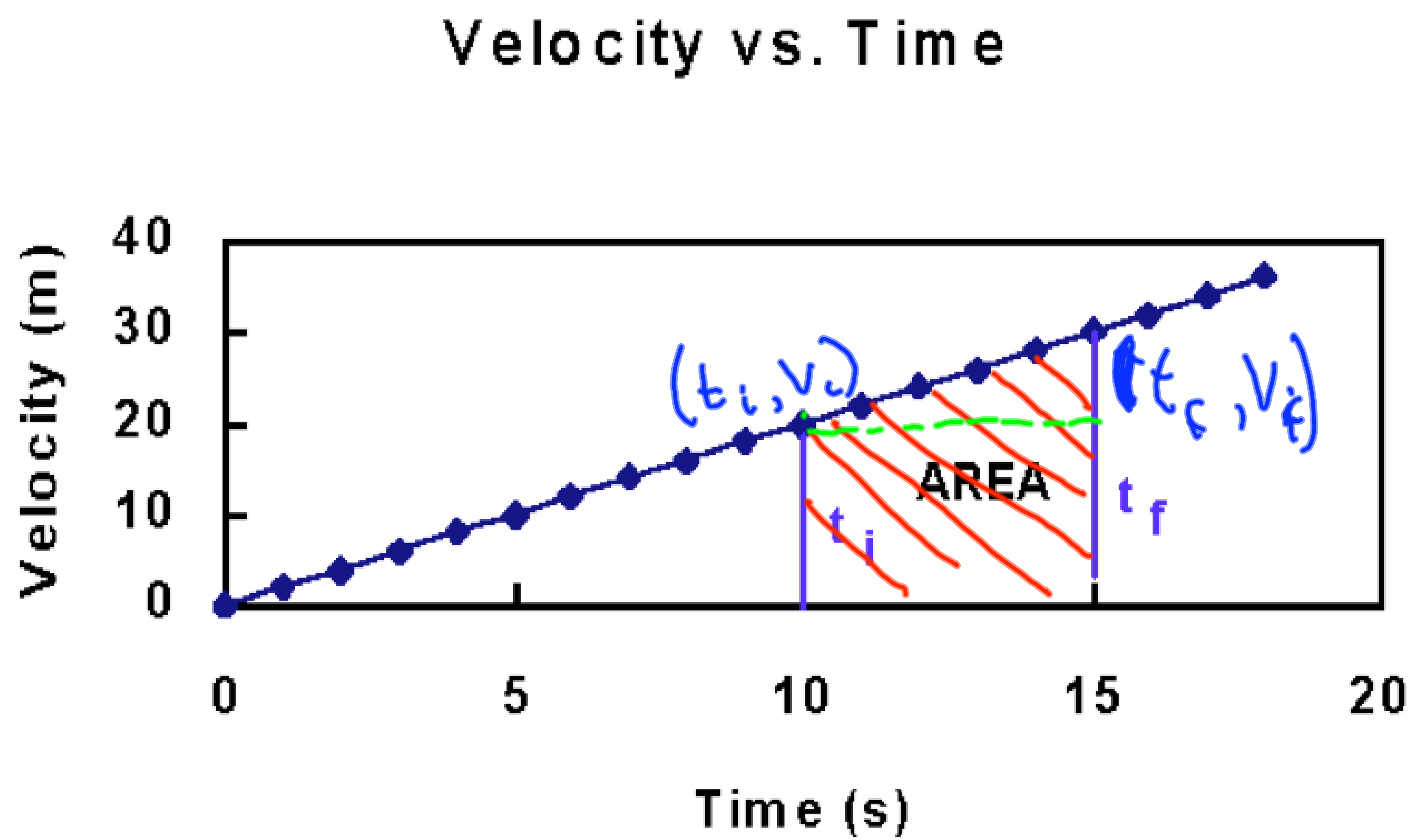
$a = \frac{\Delta v}{\Delta t}$ $\Delta v = a\,\Delta t$

Acceleration vs. Time



The area of the indicated region (Length x Width) is equal to change in velocity from t_i=3s to t_f=9s.

A 07-09-09



The area of the indicated region yields the displacement from t=10s to t=15s. If the initial time is equal to zero, then the area is a triangle (A=0.5bh), which yields the position of the object.

$$\Delta x = v_i(t_f - t_i) + \frac{1}{2}(t_f - t_i)(v_f - v_i)$$

$$\Delta x = v_i(t_f - t_i) + \frac{1}{2}(t_f - t_i)a(t_f - t_i)$$

$$\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$$ If I use a stopwatch $t_i = 0$

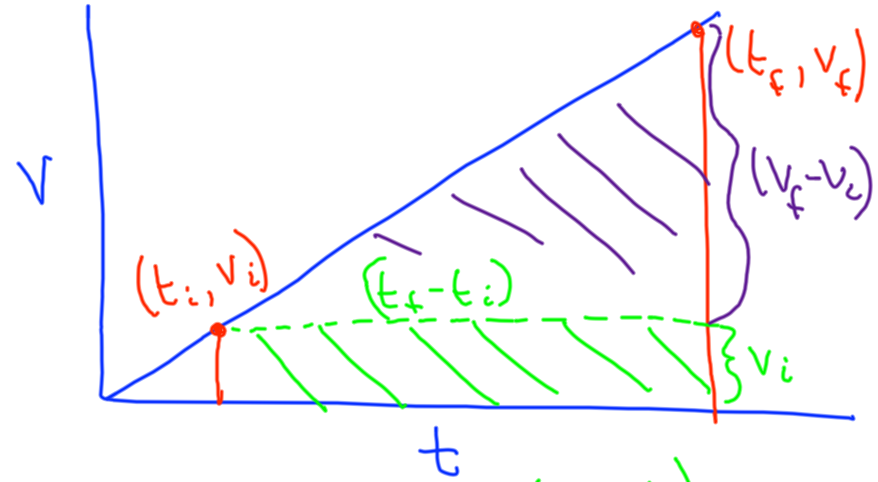
$$\Delta t = t_f - 0 = t_f = t$$

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

$$v_f^2 - v_i^2 = 2a \Delta x$$

$$v_{avg} = \frac{\Delta x}{\Delta t} = \frac{v_i + v_f}{2}$$

A 07-09-09



green area $= v_i (t_f - t_i) = v_i \Delta t$

purple area $= \frac{1}{2}(t_f - t_i)(v_f - v_i)$

TOTAL area

$v_i \Delta t + \frac{1}{2} \Delta t \underbrace{(v_f - v_i)} = \Delta x$

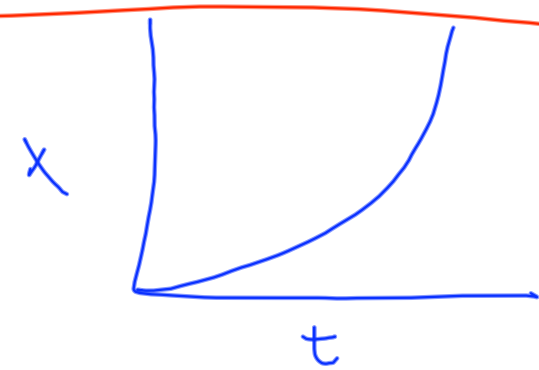
$v_i \Delta t + \frac{1}{2} \Delta t [a \Delta t] = \Delta x$

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

let's use stopwatch

$t_i = 0$ say $t_f = t$

$$\boxed{\Delta x = v_i t + \frac{1}{2} a t^2 = x_f - x_i}$$



assumes down is neg

Motion-Due to Gravity

$a = -g$

- **Important kinematic equations for motion in one dimension for objects under the influence of gravity.**
- **Note g=9.8006m/s^2**
- **Compare to textbook!**

$$\Delta s = v_i t - \frac{1}{2} g t^2$$

$$v_f^2 = v_i^2 - 2g\Delta s$$

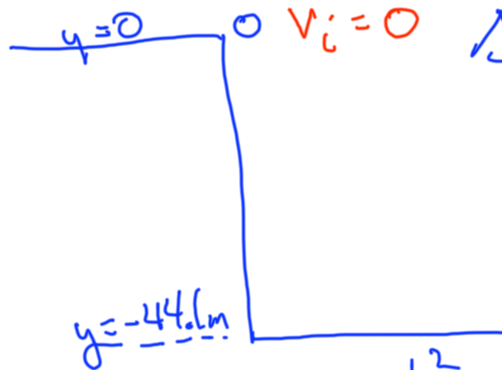
$$v_{avg} = \frac{v_f + v_i}{2}$$

$$v_f = v_i - gt$$

- An object is dropped from rest off a 44.1m platform.
  - How long will it take to hit the ground?
  - What is its average velocity when it hits the ground?
  - What is its final velocity when it hits the ground?

$a = -9.80\,\frac{m}{s^2}$

$v_i = 0$ $\quad \Delta y = -44.1m$



$$\Delta y = \frac{1}{2}at^2$$

$$t = \sqrt{\frac{2\Delta y}{a}} = \sqrt{\frac{2(-44.1\cancel{m})}{-9.80\frac{\cancel{m}}{s^2}}}$$

$$= 3.00s$$

$$V_{avg} = \frac{\Delta y}{\Delta t} = \frac{-44.1m}{3.00s} = -14.7\frac{m}{s}$$

$$V_f^2 = 2a\Delta y$$

$$V_f = \sqrt{2a\Delta y}$$

$$= \sqrt{2(-9.80\tfrac{m}{s^2})(-44.1m)}$$

$$= -29.4m/s$$