Reminders 9-13-10:

-3rd Webassign Due 9/16

-Exam 1 Monday Sept 20 Homework 1-3.

-Quiz Wednesday on Kinematics

-Conceptual Questions on Kinematics Wednesday (Printout from BlackBoard.

Objectives:

-Equations of Motion for Constant Acceleration

-Examples

- **An 3000kg truck is traveling at 20.0 mph to the right. It then accelerates at a rate of 5.0 mph/s in 10.0s (to the right).**
  - **What is its acceleration in ft/s²?**
  - **What is the speed of the truck after 10.0s?**
  - **What is the net force acting on it?**

$\vec{a} = \frac{\Delta \vec{V}}{\Delta t}$ $\quad a = \frac{v_f - v_i}{\Delta t}$

$5.0 \frac{\text{mi/h}}{\text{s}} \cdot \frac{5280 \text{ ft}}{\text{mi}} \cdot \frac{1 \text{ h}}{3600 \text{ s}} = 7.33 \frac{\text{ft}}{\text{s}^2}$

$a\Delta t = v_f - v_i$

$v_f = v_i + a\Delta t$

$= \left(20.0 \frac{\text{mi}}{\text{h}}\right) + \left(5.0 \frac{\text{mph}}{\text{s}}\right)(10.0 \text{s})$

$= 70.0 \text{ mph}$

Convert 20 mph to ft/s

$20 \frac{\text{mi}}{\text{h}} \cdot \left(\frac{5280 \text{ ft}}{\text{mi}} \quad \frac{1 \text{ h}}{3600 \text{ s}}\right) = 29.33 \text{ ft/s}$

$1.46\overline{6}$

$= 29.33 \text{ ft/s} + \left(7.33 \frac{\text{ft}}{\text{s}^2}\right)(10.0 \text{s})$

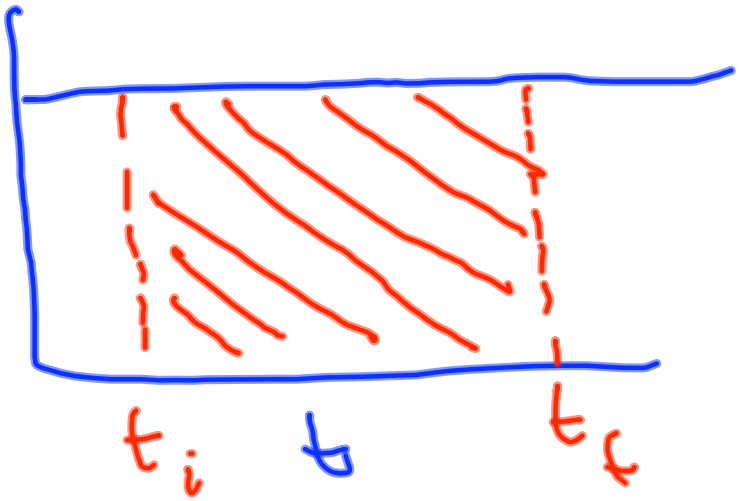
$= 29.33 \text{ ft/s} + 73.33 \text{ ft/s}$

$= 102.66 \text{ ft/s}$

$F_{net} = ma$

$= (3000 \text{kg}) \left(\frac{7.33 \text{ ft}}{\text{s}^2} \left(.305 \frac{\text{m}}{\text{ft}}\right)\right)$

$= 6700 \text{ N}$



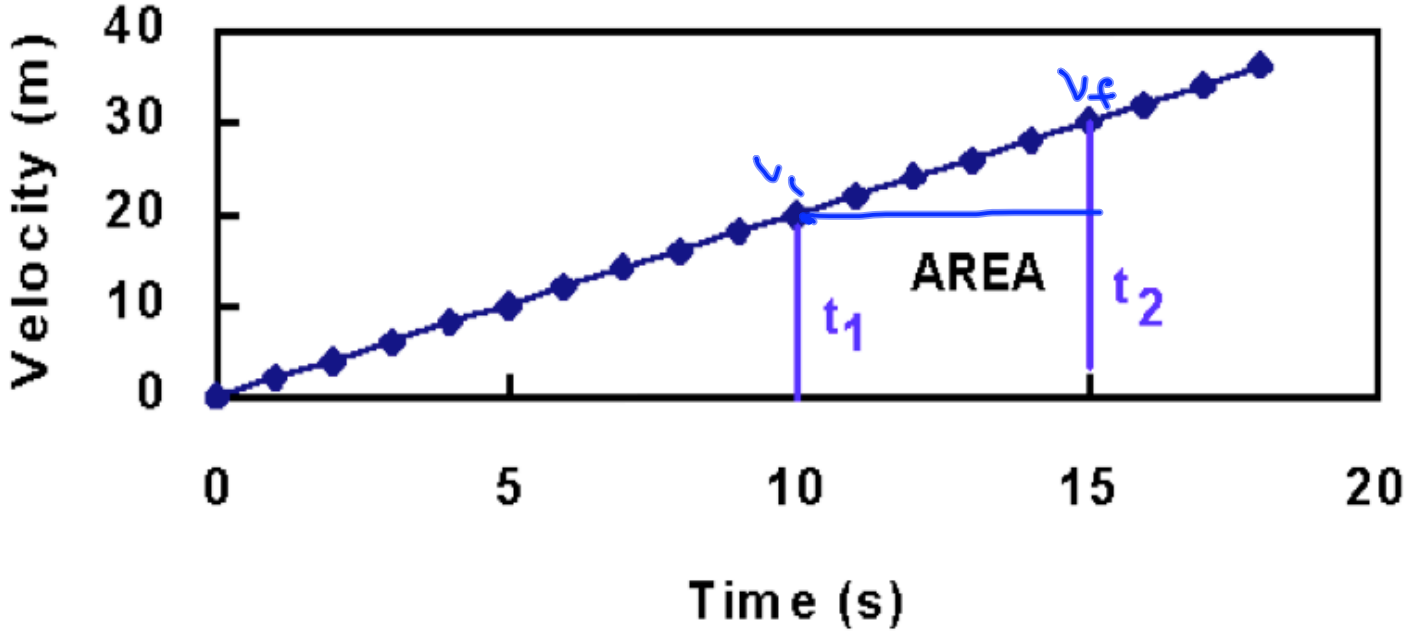
$$a = \frac{\Delta v}{\Delta t}$$

$$\Delta v = a \Delta t$$

$$Area = a(t_f - t_i) = a \Delta t$$

$$v_f - v_i = a \Delta t$$

$$\boxed{v_f = v_i + a \Delta t}$$



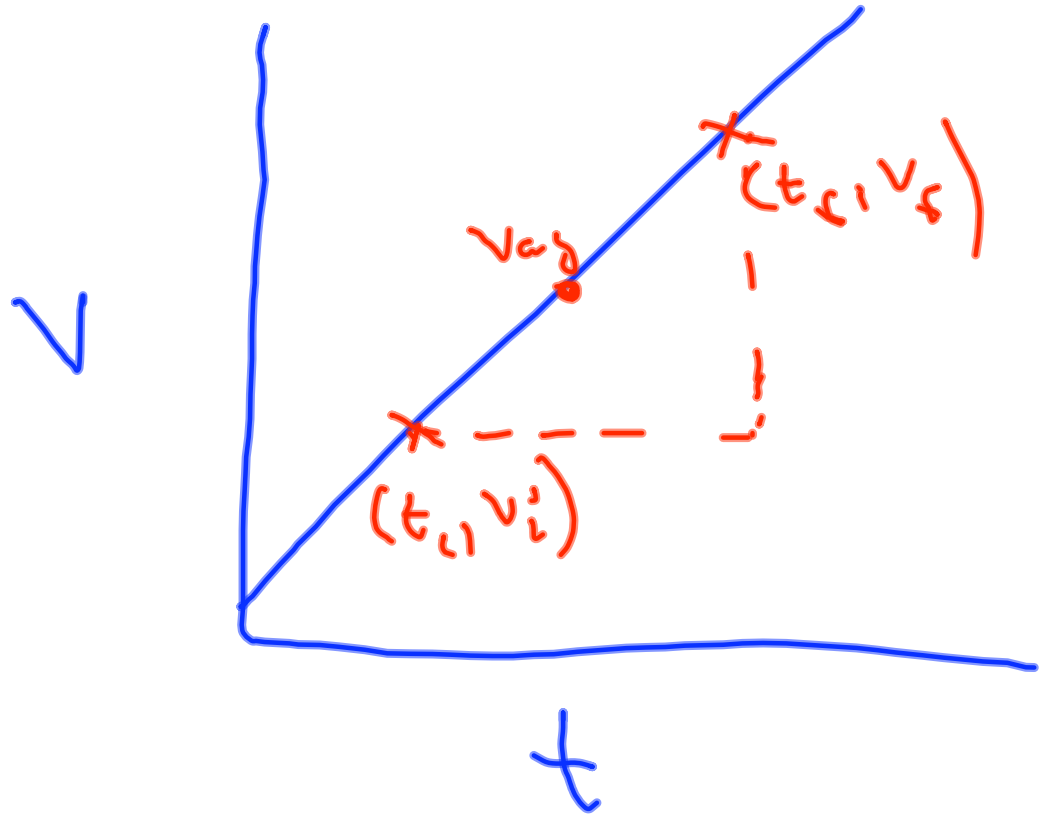
Rectangle $= v_i(t_2 - t_i)$

Triangle $= \frac{1}{2}(t_2 - t_1)(v_f - v_i)$

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

$$= v_i \Delta t + \frac{1}{2}\Delta t(a\Delta t)$$

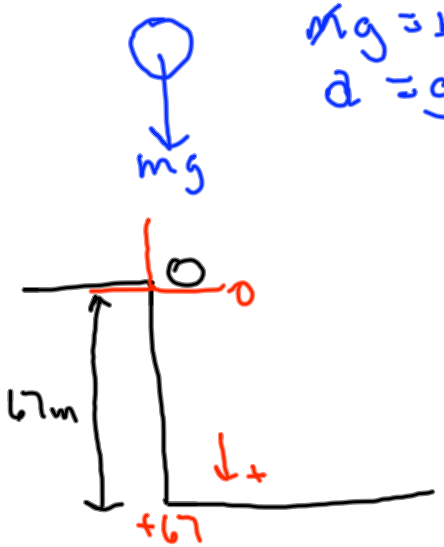
$$= \boxed{v_i t + \frac{1}{2} a (\Delta t)^2}$$



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

Example

- **An object is dropped from a 67 m high building. Ignore air friction.**
  - **How long will it take to get to the ground?**
  - **What will the average velocity be from the top of the building to the bottom?**



$mg = ma$

$a = g$

$v_i = 0$

$a = +9.8\ m/s^2$

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

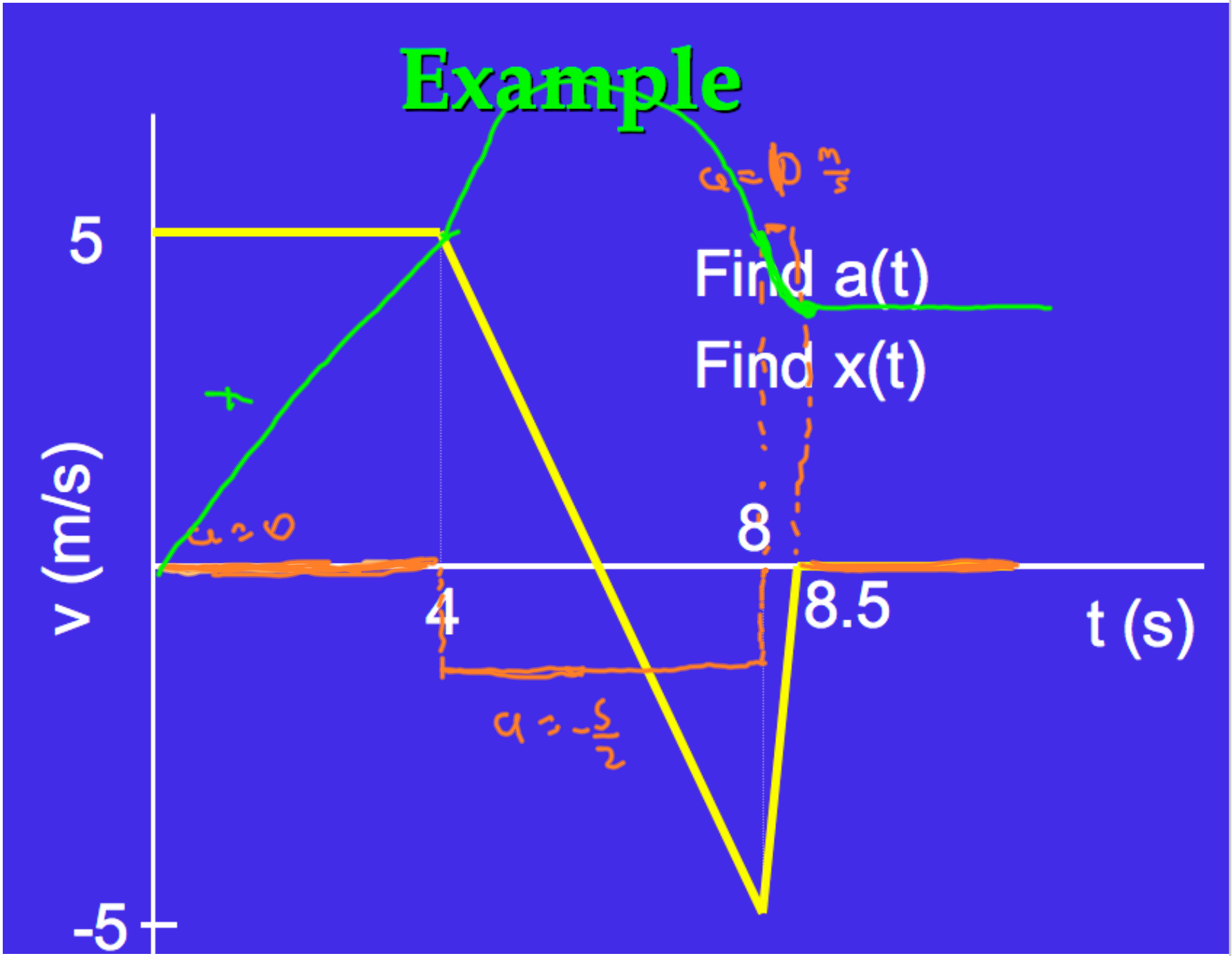
$\sqrt{\frac{2\Delta x}{a}} = t$

$\sqrt{\frac{2(67m)}{9.80\ m/s^2}} = t = 3.7s$

$v_{avg} = \frac{\Delta y}{\Delta t} = \frac{67m}{3.7s} = 18\ m/s$ down

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

$v_f = 2v_{avg} = 36\ m/s$



Title: Sep 13-3:55 PM (7 of 7)