Reminders 01-26-10:

-ADDS IN RECITATION OR IN LAB

Lecture 11-12:20PM MW ALL SECTIONS

Section 42167 12:45-1:50PM T(Recitation)-Th(lab)-FULL

Section 42168 2:00-3:05PM M(Recitation)-W(lab)

Section 42169 9:30-10:35AM M(Recitation)-W(lab)-FULL

Section 42170 8:15-9:30PM M(Recitation)-W(lab)-AVAILABLE

Students will be dropped without notice on the 3rd lab or recitation absence or the 5th lecture absence.

-1st Quiz in Recitation next week.

-1st POW due Tuesday by 5PM

-Read Chapters 2&3

-Log onto Webassign ASAP, sierracollege 8874 0123!!!

-Lab software can be obtained from desktop of computers in lab.

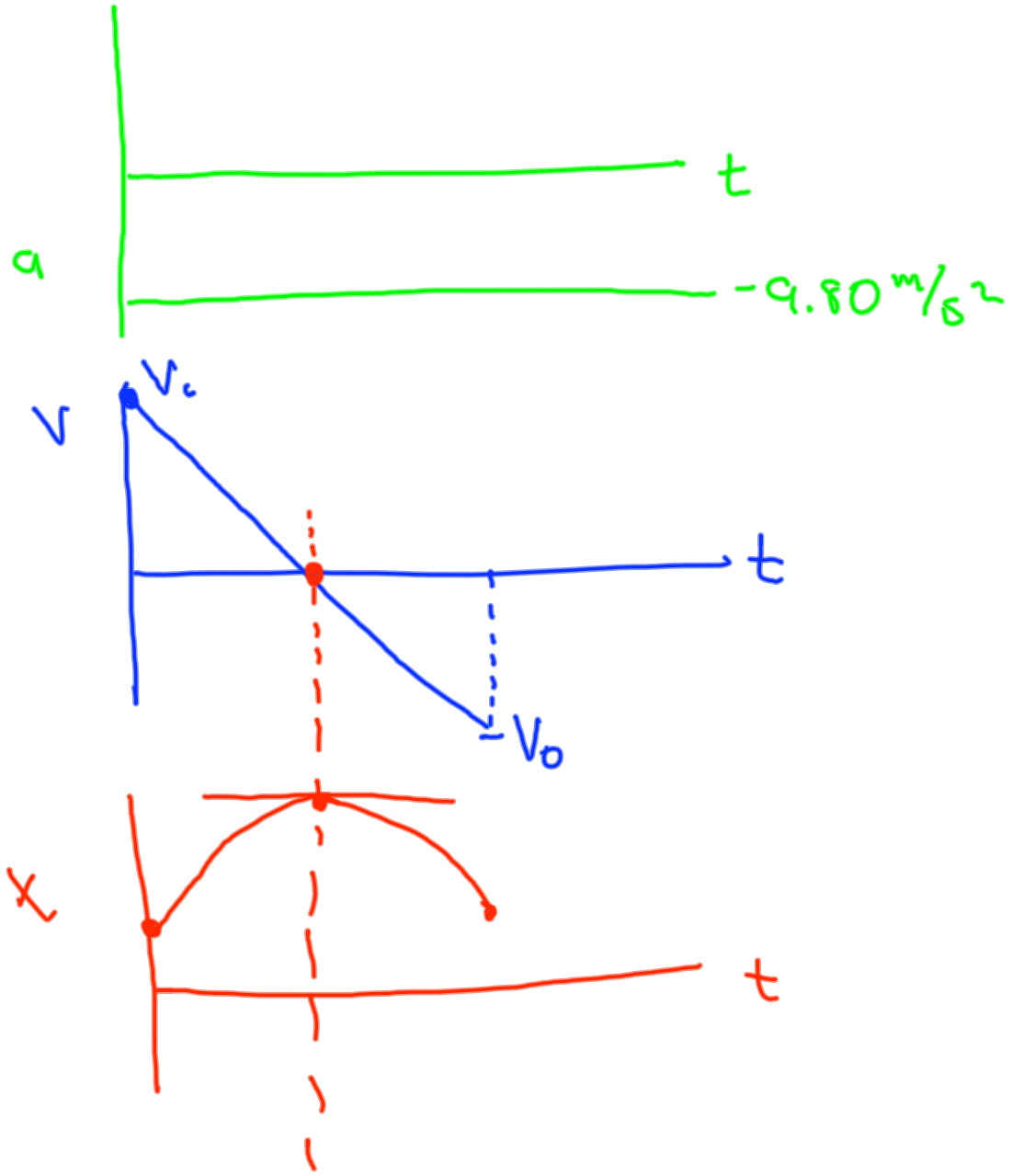
-All graded items are placed in a basket outside my office.

Objectives:

-Free Fall with Examples

-Vectors Basics

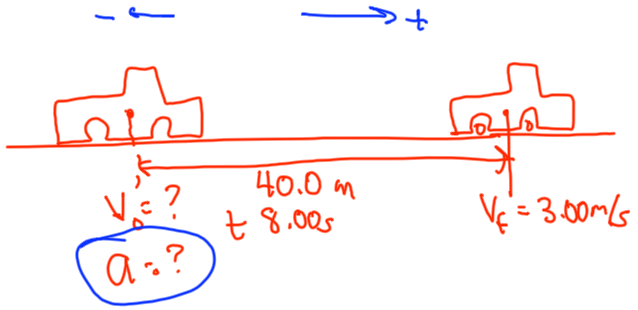
Plot the position, velocity, and acceleration vectors of a object thrown upward.



Example: A car covers 40.0m in 8.00s while smoothly slowing down to 3.00m/s. Calculate its acceleration.

Problem Solving Routine:

- **Draw a sketch**
- **Set up coordinate system**
- **List knowns and unknowns**
- **Select proper equations(s)**



$$\frac{\Delta x}{\Delta t} = \frac{1}{2}(V_{ox} + V_x)$$

$$2\left(\frac{\Delta x}{\Delta t}\right) = V_{ox} + V_x$$

$$V_{ox} = 2\left(\frac{\Delta x}{\Delta t}\right) - V_x$$

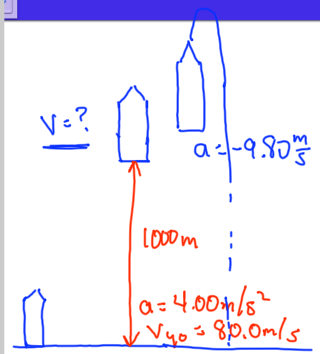
$$= 2\left(\frac{40.0\,m}{8.00\,s}\right) - 3.00\,\frac{m}{s}$$

$$= 10.0\,\frac{m}{s} - 3.00\,\frac{m}{s} = 7.00\,\frac{m}{s}$$

$$a = \frac{\Delta v}{\Delta t} = \frac{3.00\,\frac{m}{s} - 7.00\,\frac{m}{s}}{8.00\,s} = \boxed{-0.50\,\frac{m}{s^2}}$$

ple: A test rocket is fired vertically upward with an initial velocity of 80.0m/s at ground level. The acceleration due to its engines is 4.00m/s². The engines maintain this acceleration until they fail at an altitude of 1000m. At that point the test rocket begins freefall motion.

How long is the test rocket in motion?
What is its maximum altitude.
What is its velocity just before it collides with the Earth?



find v at 1000 m just before engine fails

$$V = \sqrt{V_{y0}^2 + 2a_y \Delta y}$$

$$= \sqrt{\left(80.0\tfrac{m}{s}\right)^2 + 2\left(4.00\tfrac{m}{s^2}\right)(1000\,m)}$$

$$= 120\ \tfrac{m}{s}$$

Find free fall time

$$0 = 1000\,m + 120\tfrac{m}{s}t - \tfrac{1}{2}\left(9.80\tfrac{m}{s^2}\right)t^2$$

use quadratic formula

$$4.9t^2 - 120t - 1000 = 0$$

$$t = \frac{120 \pm \sqrt{(120)^2 - 4(4.9)(1000)}}{9.80}$$

$t = 31.1s$

$V_y - V_{y0} = a_y t$ $\quad t = \frac{V_y - V_{y0}}{a_y} = \frac{40\frac{m}{s}}{4.00\frac{m}{s^2}}$

$t = 10s$

$t_{total} = 10s + 31.1s = 41.1s$

find max height

$V_y^2 = V_{y0}^2 + 2a_y \Delta y$

$\frac{V_y^2 - V_{y0}^2}{2a_y} = \Delta y = \frac{0 - \left(120\frac{m}{s}\right)^2}{2\left(-9.80\frac{m}{s^2}\right)}$

$\Delta y = 735\,m$ above 1000 m mark

altitude = 1735 m

Velocity before it hits earth.

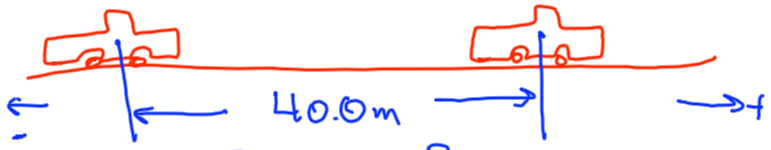
$V_0 = \sqrt{2(1735\,m)\left(-9.80\frac{m}{s^2}\right)}$

$= -184\frac{m}{s}$

Example: A car covers 40.0m in 8.00s while smoothly slowing down to 3.00m/s. Calculate its acceleration.

$\Delta x = 40.0\,m$ $\quad V_f = 3.00\,m/s$

$\Delta t = 8.00\,s$



$V_i = ?$ $\quad a = ?$

$$V_{avg} = \frac{\Delta x}{\Delta t} = \frac{40.0\,m}{8.00\,s} = 5.00\,m/s$$

$$V_{avg} = \frac{1}{2}(V_{x0} + V_f)$$

$$2V_{avg} - V_f = V_{x0}$$

$$V_{x0} = 2(5.00\,m/s) - 3.00\,m/s = \underline{7.00\,m/s}$$

$$a = \frac{\Delta V}{\Delta t} = \frac{3.00\,m/s - 7.00\,m/s}{8.00\,s}$$

$$= \frac{-4.00\,m/s}{8.00\,s} = -0.500\,m/s^2$$