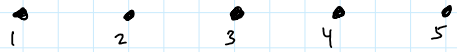
Phy 4A 9/26

Monday, September 26, 2016 9:50 AM

Goals for the Lecture:

1) Introduce myself and the course
2) Discuss good study habits
3) Be able to do unit conversions
4) Be able to add vectors graphically and using components (trig functions)

Motion Diagrams:



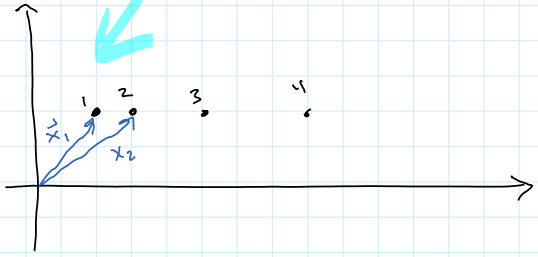
moving to the right w/ constant speed

moving to the right and speeding up

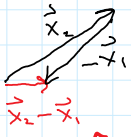
moving to the right and slowing down

Position: $\vec{x}$

velocity: $\frac{\vec{x}_2 - \vec{x}_1}{t_2 - t_1}$

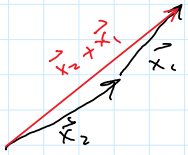


find $\vec{x}_2 - \vec{x}_1$:

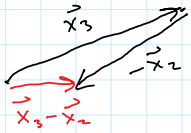


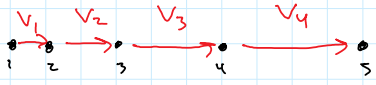
proportional to velocity

$\vec{x}_2 + \vec{x}_1$:



find $\vec{x}_3 - \vec{x}_2$:





V_1 is average velocity between t_1 and t_2

acceleration: $\frac{\vec{V}_2 - \vec{V}_1}{\Delta t}$

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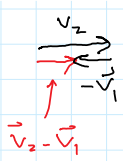
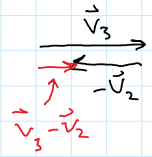


$\frac{\vec{V}_3 - \vec{V}_2}{\Delta t}$



acceleration is constant: $\rightarrow \vec{a}$

Worksheet P.33

Top: Displacement $\Delta \vec{X}$

Velocity: $\frac{\Delta \vec{X}}{\Delta t}$

$\Delta \vec{X}_A = 4\ m$

$\Delta \vec{X}_B = 1\ m$

$\Delta \vec{X}_C = 6\ m$

$\Delta \vec{X}_D = 9\ m - 1\ m = 8\ m$

when $\vec{a}$ and $\vec{v}$ have same sign (point in same direction) $\rightarrow$ speed is increasing

when $\vec{a}$ and $\vec{v}$ have opposite signs (point in opposite directions) $\rightarrow$ speed is decreasing

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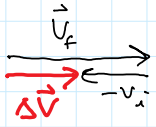
Before: $+10\ \frac{m}{s}$

After: $+20\ \frac{m}{s}$

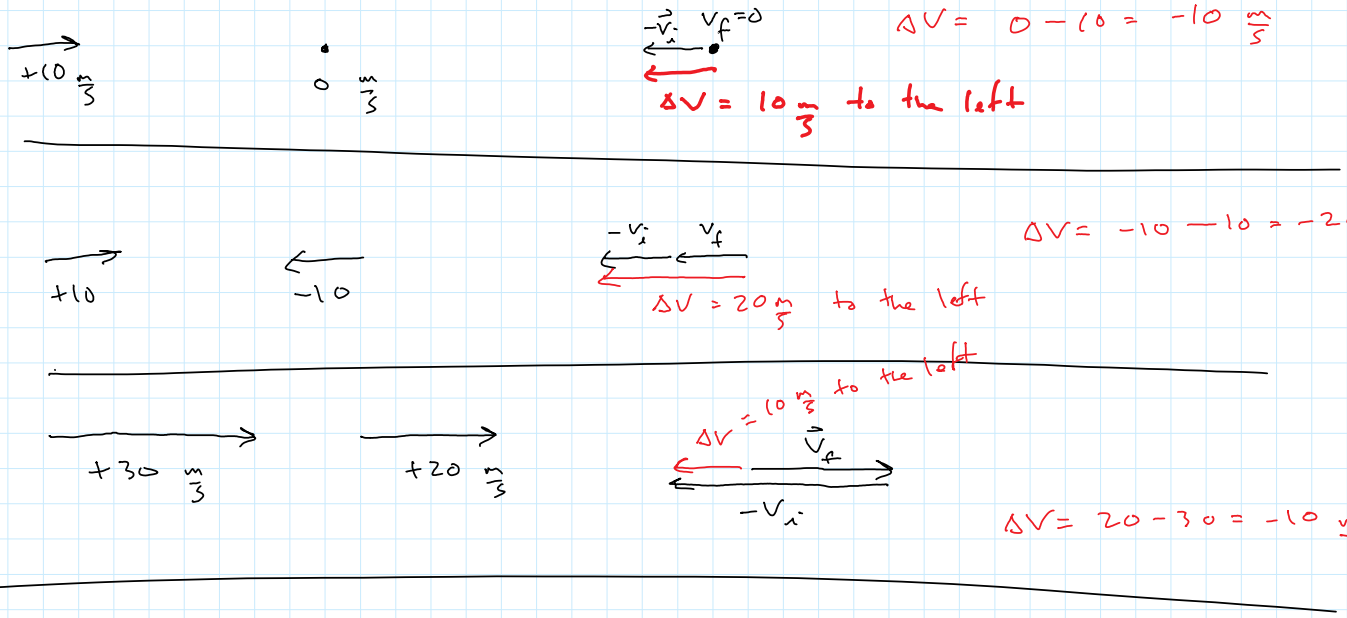
$\Delta \vec{V} = \vec{V}_f - \vec{V}_i$



$\Delta V = V_f - V_i = 20 - 10 = +10\ \frac{m}{s}$

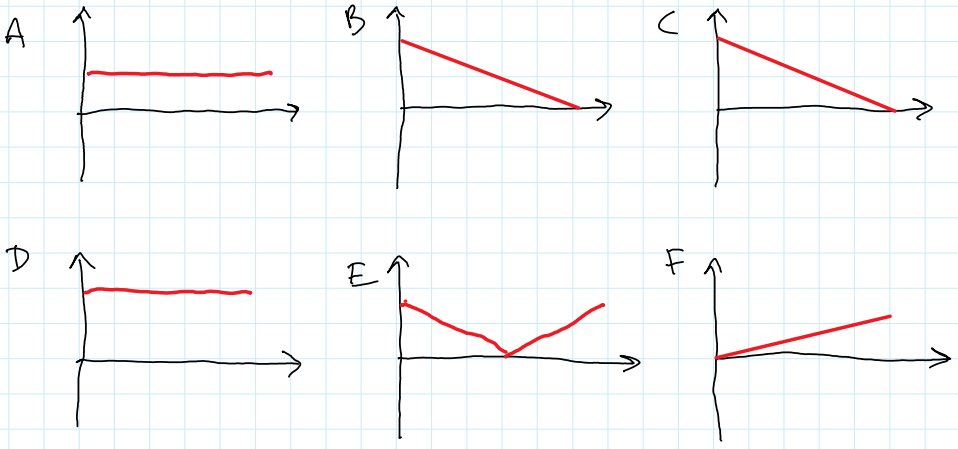
$\Delta \vec{V} = +10\ \frac{m}{s}$ (to the right)

$\Delta V = 0 - 10 = -10\ \frac{m}{s}$

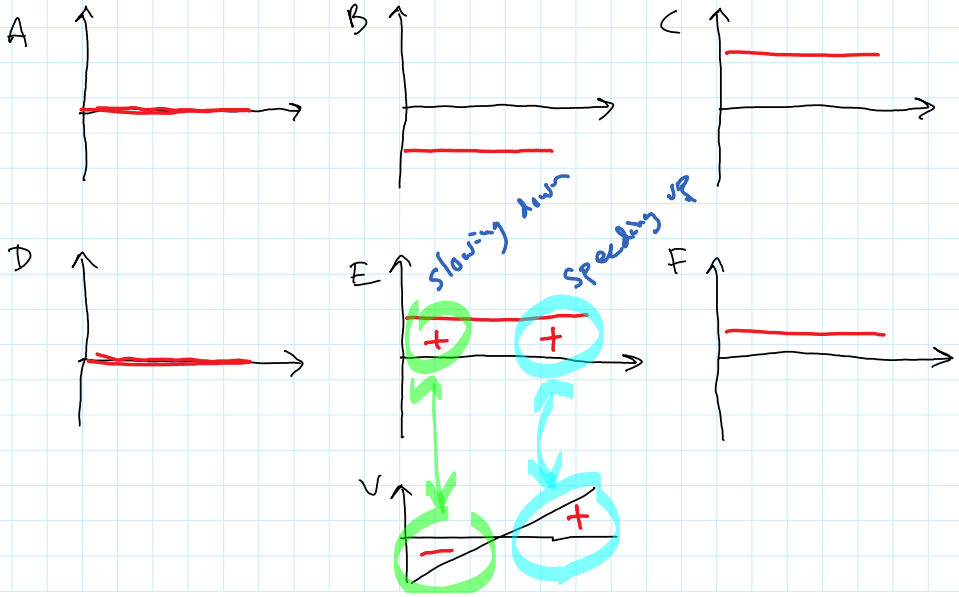


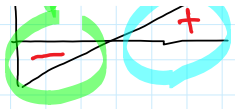
Worksheet P. 37

Speed vs. time



Acceleration vs. time





Kinematics:

$$V_f = V_i + at$$

$$x_f = x_i + v_i t + \frac{1}{2} a t^2$$

$$a = \frac{\Delta v}{\Delta t} \quad \text{average}$$

$$a = \frac{dv}{dt}$$

$$\int a\, dt = \int dv \quad \text{if } a \text{ is constant}$$

$$at = v_f - v_i$$

$$\boxed{V_f = V_i + at}$$

$$x_f = x_i + \left(\frac{V_i + V_f}{2}\right) t$$

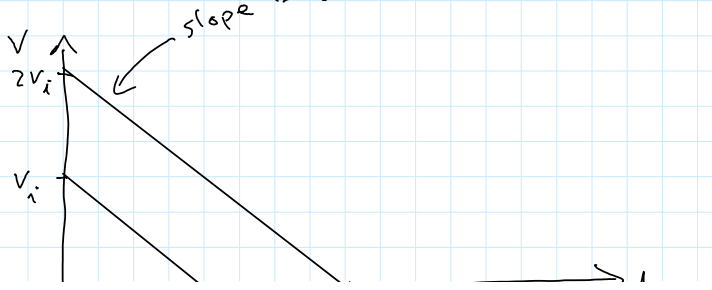
$$V_f^2 = V_i^2 + 2a\Delta x$$

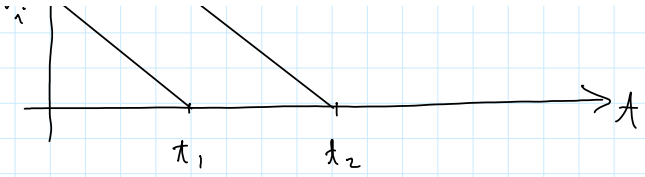
Book Prob #2-24 (w/ different numbers)

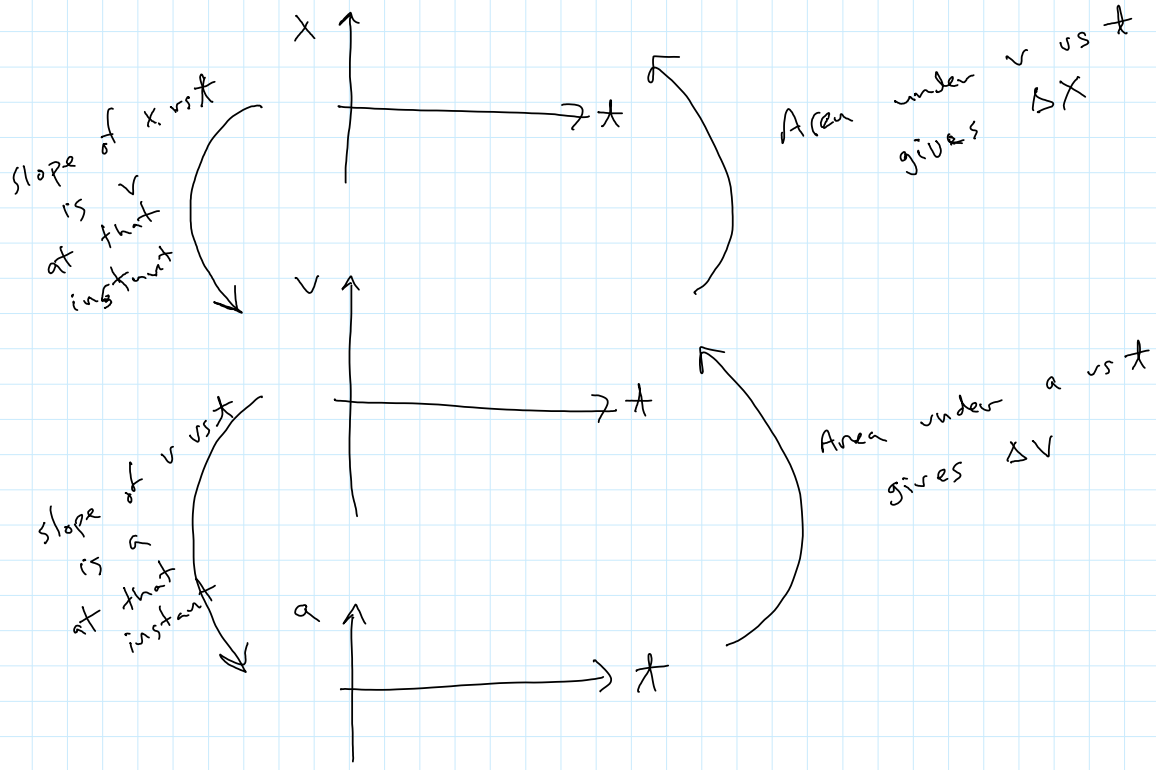
$V_i = 15.5 \frac{m}{s}$ stopping distance = 14 m

if $V_i = 31.0 \frac{m}{s}$ find stopping distance

graphically:




t
t_1
t_2


x
t
slope of x vs t is v at that instant
Area under v vs t gives Δx
v
t
slope of v vs t is a at that instant
Area under a vs t gives Δv
a
t