AP Physics Chapter 4 Review - Newton

Newton's 3 Laws of Motion -

1) Inertia

2) Fnet = ma

3) equal and opposite

Newton's Law of Gravity

Green m&m's are square!

$F_g = Gm_1m_2/r^2$ AND **Fg = mg** (ON EARTH!)

Inverse square law

ex.

If Fg = 90 N and r triples, what is the new Fg? $\times 3 \rightarrow \left(\frac{1}{3}\right)^2 F_g$ 10N

If Fg = 200 N and r halves, what is the new Fg? $\times \frac{1}{2} \rightarrow (2)^2 F_g$ 800N

If Fg = 500 N and r doubles and one mass doubles, what is the new Fg? 250N

$$\frac{G2mm}{(2r)^2} = \frac{1Gmm}{2r^2}$$

Fnet relationships:

-- m↑ a↓ are INVERSELY related

-- F↑ a↑ are DIRECTLY related

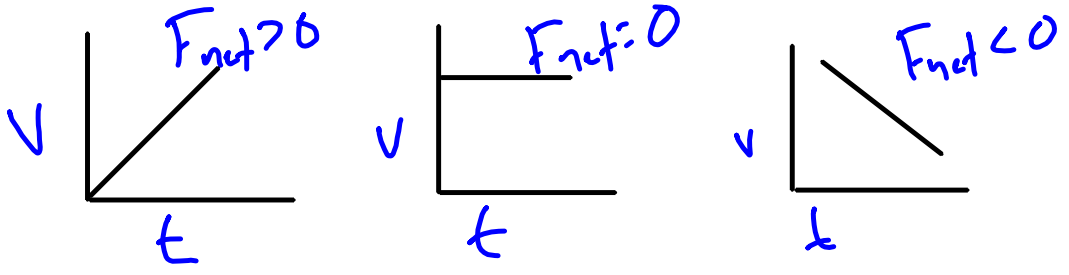
-- F↑ m↑ are DIRECTLY related

Since ...Fnet = ma

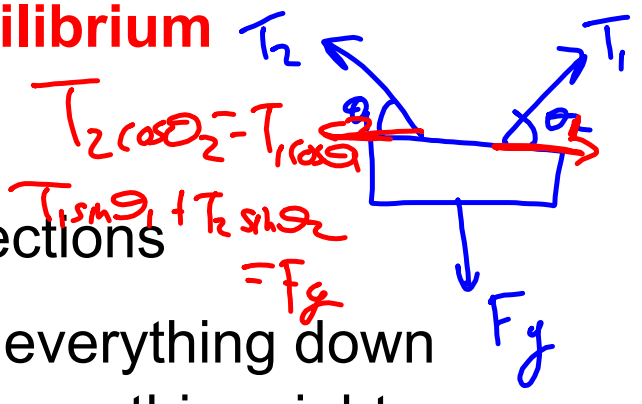
And...a = (vf-vo)/t

so.....Fnet = $\frac{m(vf-vo)}{t}$

Graphs v vs t and Fnet



When Fnet = 0 = **Equilibrium**



1) a = 0

2) Fnet = 0 in ALL directions

3) everything up = to everything down
everything left = to everything right

4) v is CONSTANT or object is at REST

5) ex. terminal velocity, moving at constant velocity, hanging sign

Fnet $\neq$ 0 = **nonequlibrium**

1) a $\neq$ 0 and can be + or -

2) ALWAYS draw FBD for ALL objects!!!

3) Set $\Sigma F_x = ma_x$ and $\Sigma F_y = ma_y$ * one is usually 0

examples:

elevators

Cart moving with hanging mass

Box accelerating down incline

Types of forces

1) Gravity downwards $F_g = mg$

2) Normal ⊥

3) Friction/Air Resistance opposite motion //

   a) Static $f_s \leq \mu_s N$

   b) Kinetic $f_k = \mu_k N$

4) Tension due to reaction force

FBD: