Newton's Laws

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Mechanics: Motion w/ Cause

what is a force?

* (Pressure)(Area)
* push / pull
* Newton's 3rd law
* magnitude + direction
* something to overcome Inertia
* mass times accel .... kinda
* many types
* Interaction between masses

Types of Forces (our model)

* Tension : pull (C)
* Friction : // to surface (C)
* gravity : pull downward ... towards masses (NC)
* Normal : ⊥ to surface, push (C)
* Compression (C)
* (Pressure)(Area) (C)
* Electric & Magnetic (NC)
* drag (C)
* thrust (C)
* lift (C)
* spring (C)
* Buoyancy (C)

Advanced Model

* gravity (NC)
* Nuclear weak (NC)
* Nuclear Strong (NC)
* Electric & Mag. (NC)

Method: Applying Newton's Laws

1.) Objects @ rest stay at rest unless acted upon
" " moving " moving " " "

2.) $\sum \vec{F}_{\text{external to system acting on system}} = M_{\text{system}} \vec{a}_{\text{center of mass of system}}$

3.) Every action has an equal & opposite reaction
* Force is an Interaction between 2 objects
* $\vec{F}_{12} = -\vec{F}_{21}$

Steps to Solving Mechanics Problems

1.) Visualize

2.) Identify system(s) of Interest

3.) " " Interactions w/ system(s) (external forces)

4.) Draw a Free-Body Diagram (FBD) of system(s)

a.) Labeling $\vec{F}^{\text{type}}_{\text{agent on object}}$ ex. gravity $\vec{F}^{g}_{Em}$ (Earth on me)

b.) Identify Newton's 3rd law force Pairs. (F.P.)
* requires a FBD for each object
* Never have two F.P. on same FBD

5.) Apply 2nd Law Algebraically using forces on FBD

6.) Solve.... connect to kinematics via acceleration