

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)

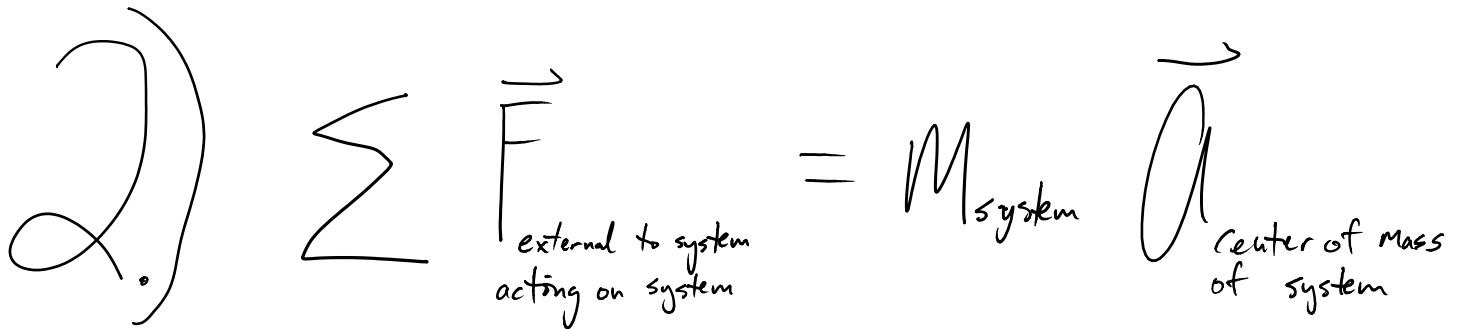
- * Tension : pull (C)
- * Friction : // to surface (C)
- * gravity : pull downward ... towards masses (NC)
- * Normal : \perp to surface, push (C)
- * Compression (C)
- * (pressure)(Area) (C)
- * Electric + Magnetic (NC)
- * drag (C)
- * thrust (C)
- * lift (C)
- * spring (C)
- * Buoyancy (C)

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 " " "



A diagram showing a system represented by a large bracket on the left. A dot inside the bracket represents the center of mass. To the right of the bracket is the equation $\sum \vec{F}_{\text{external to system acting on system}} = M_{\text{system}} \vec{a}_{\text{center of mass of system}}$. The vector \vec{F} has an arrow pointing to the right, and the vector \vec{a} also has an arrow pointing to the right.

- 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.) " " Interactors w/ system(s)
(external forces)
- 4.) Draw a Free-Body Diagram (FBD) of system(s)

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

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