Class 5 - Sept 26/05

Small Goose end.

SI: kg, m, s

Laws of physics define secondary units:

$F = ma$

$= kg\ m/s^2 \equiv$ newton N

§4.3 - Identifying Forces

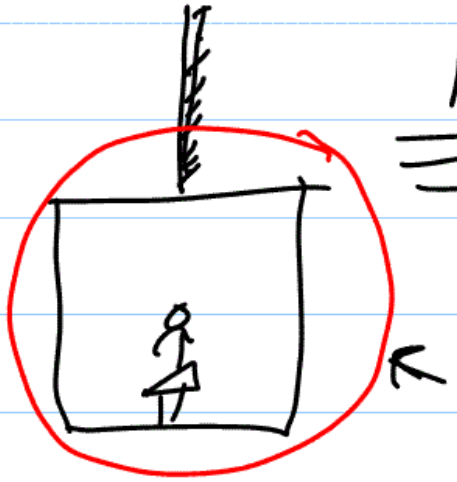
§4.7 - Free Body Diagrams

FBD

useful visualisation tool.

Example 4.4 - Elevator Accelerates Up

Pictorial



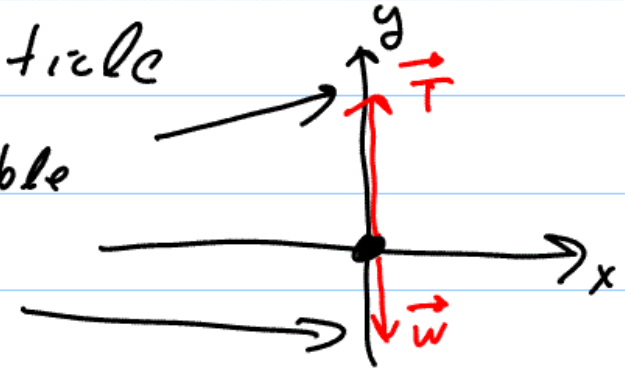
Model

system-environment boundary

model: particle

by cable

by earth



Newton's 1st Law

$\vec{F}_{net} = m\vec{a}$ (2nd Law)

$\vec{F}_{net} = 0 \Rightarrow \vec{a} = 0$

uniform motion

Only true in inertial reference frames

Newton: absolute space

master inertial frame

Any frame in uniform motion wrt is also inertial.

"with respect to"

"fixed stars" stationary wrt absolute space.

Einstein (1905): concept of abs space "superfluous"

Circular argument!

Kinematics: describe motion

dynamics: include causes of motion

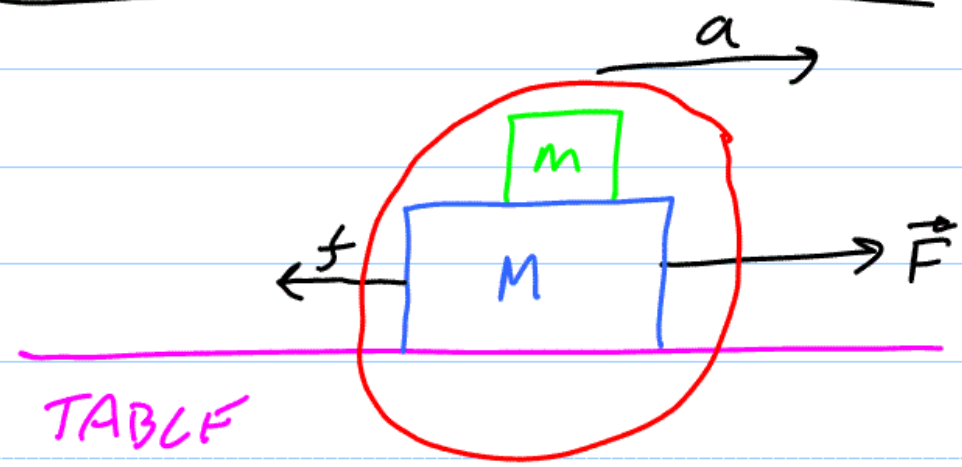
CHAPT 6 - Dynamics 1 Dimension

§5.1 - Equilibrium

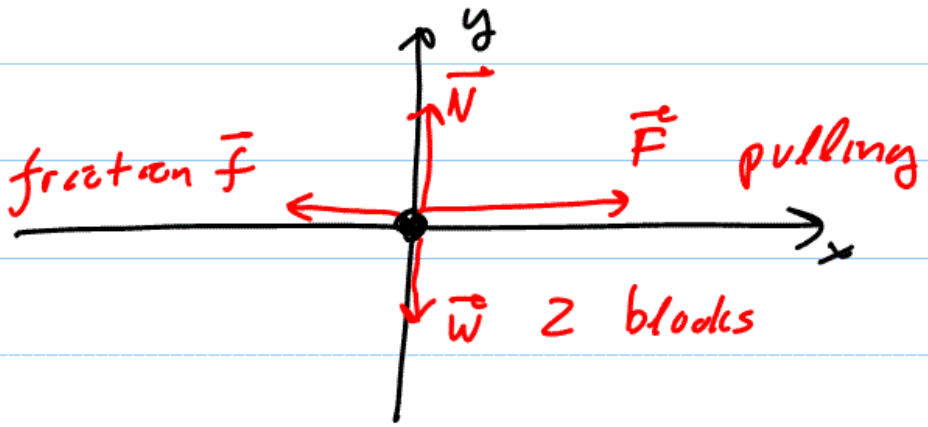
uniform motion

$$\vec{F}_{net} = 0$$

§ 5.2 - Apply 2nd Law



particle



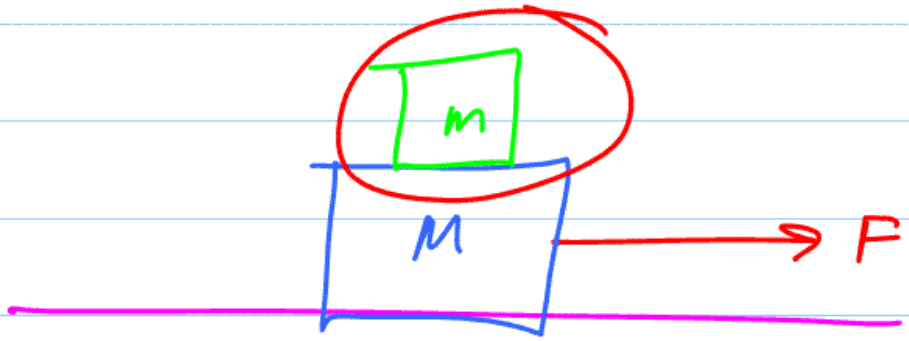
$N = w$ $\quad F > f$

$\vec{F}_{net} = m\vec{a}$

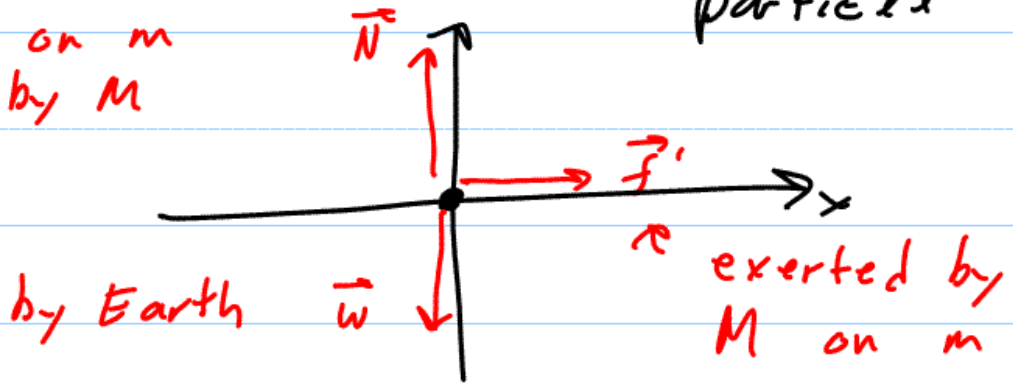
$$F_{net,x} = F - f = m_{system}\, a_x$$

$$F - f = (m + M)\, a_x$$

$$a_x = \frac{F - f}{m + M}$$



particle



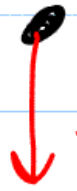
x components: $f' = ma_x$

§ 5.3 - Mass & Weight

mass ~ amount of matter

oper. defn: 1 over slope of an a vs F graph.

Near Earth's Surface

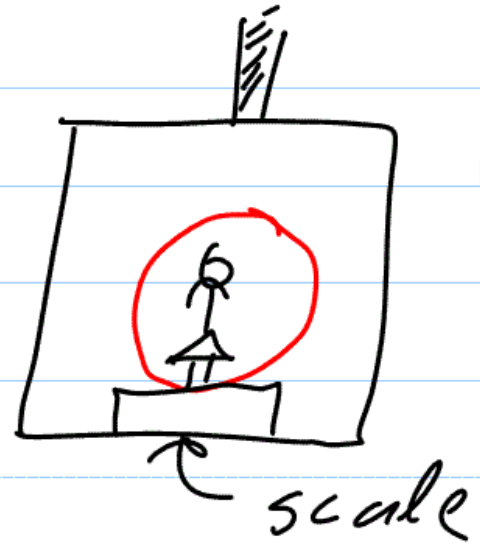


$\vec{w} = m\vec{a}$

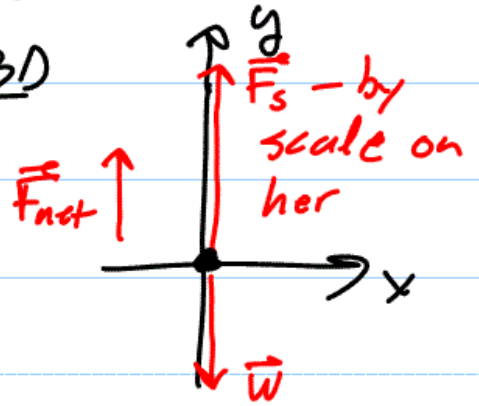
free fall $\vec{a} = \vec{g}$

$\vec{w}$ "weight"

Extend Example 44.



particle FBD



$$F_{net} = m a_y$$

$$F_s - w$$

$$F_s - mg = m a_y$$

$$F_s = mg\left(1 + \frac{a_y}{g}\right)$$

apparent weight