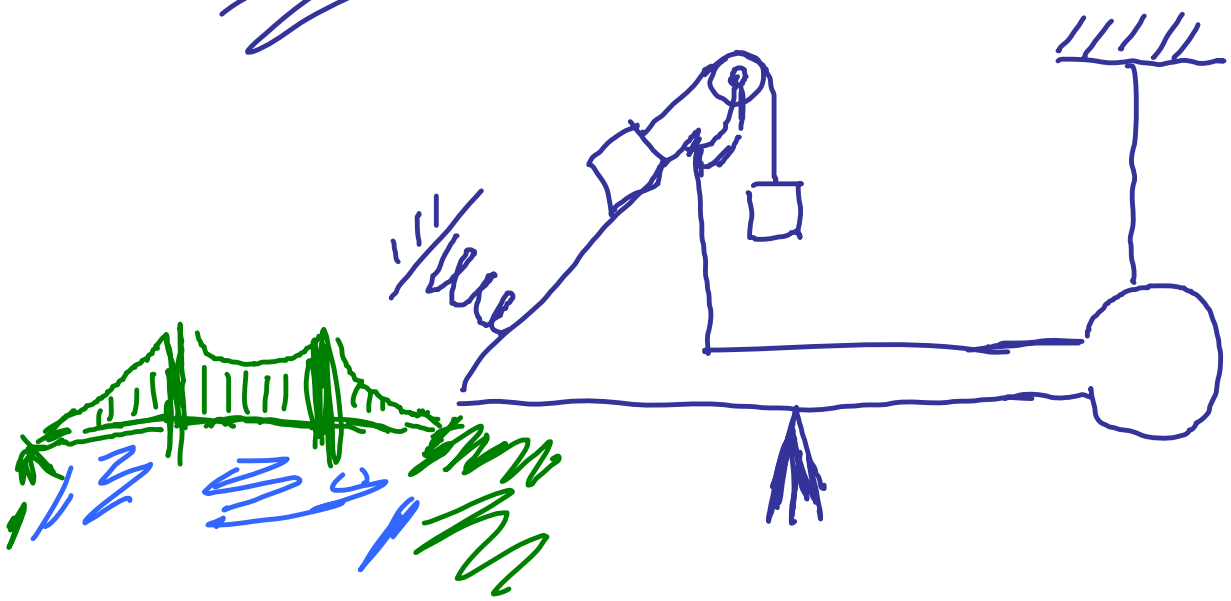
Physics 113 - November 21, 2013

Last Time

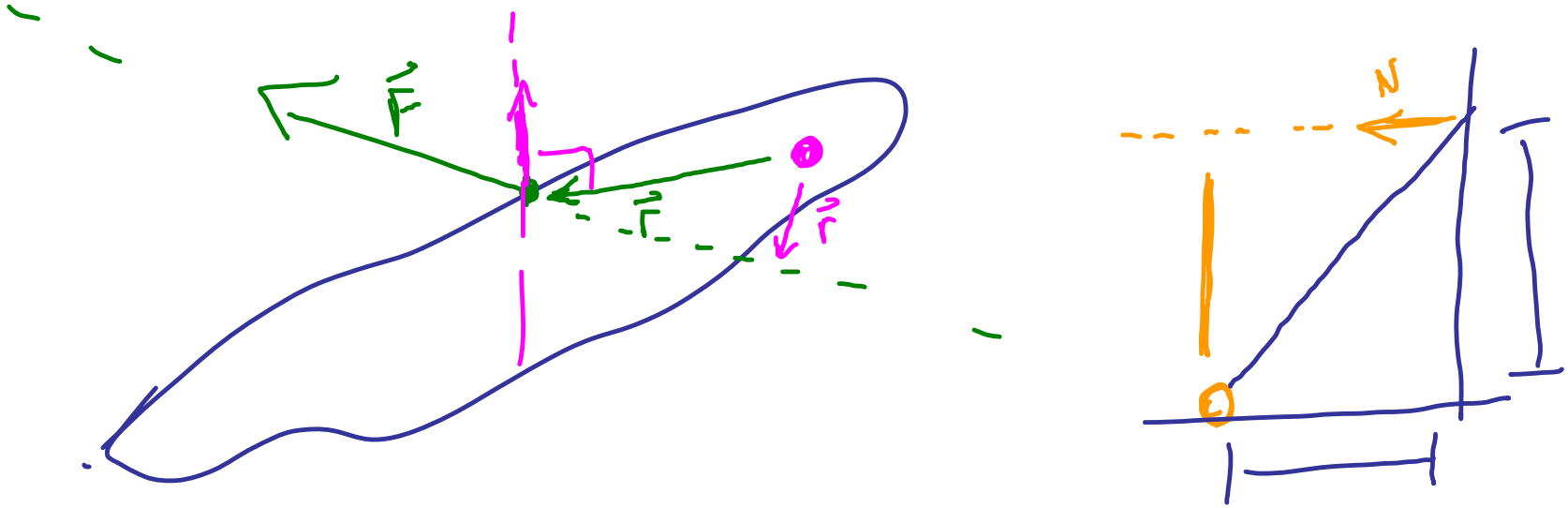


Static Equilibrium

$$\sum \vec{F} = 0$$

$$\sum \vec{\tau} = 0$$

Do Problems!


F
O
r

N
O

Fluid Mechanics

Statics (fluid Not flowing) – Hydrostatics

nonviscous

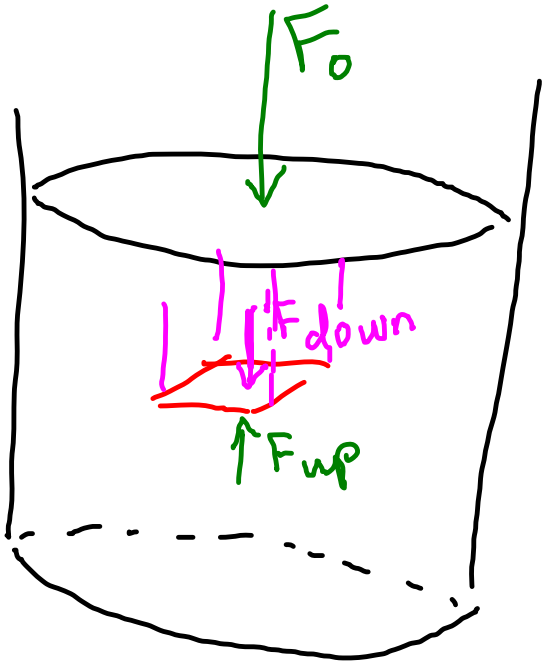
incompressible

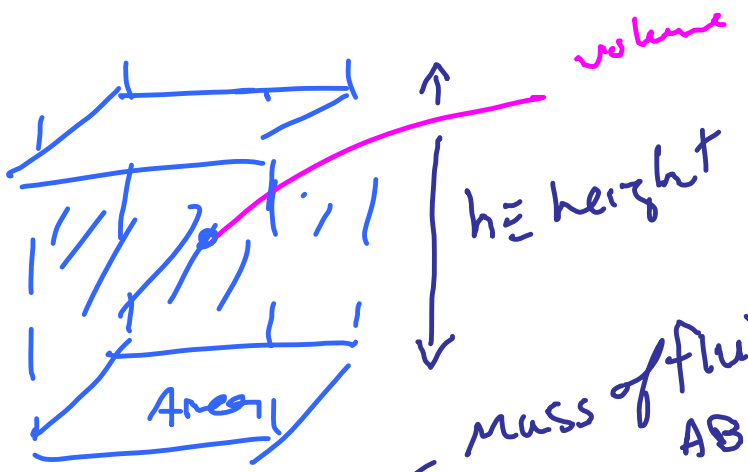
ρ volume Mass density $\quad \frac{\text{Mass}}{\text{vol.}} \quad kg/m^3$

$$\text{Specific gravity of Material} = \frac{\rho_{\text{Material}}}{\rho_{H_2O \text{ at } 4^\circ C}}$$

> 1 Sink

< 1 Float





mass of fluid ABove

$$F_{down} = F_{Air} + Mg$$

$$(F_0) \quad \rho_{water} V$$

$$\frac{F_{down}}{Area} = \frac{F_{Air}}{Area} + \frac{\rho V g}{Area}$$

$$P_{\text{top paper}} = P_{\text{top water}} + \rho g h$$

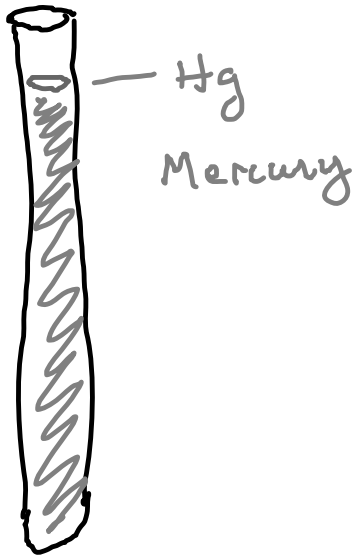
Pressure $\equiv$ Force/Area $= N/m^2$

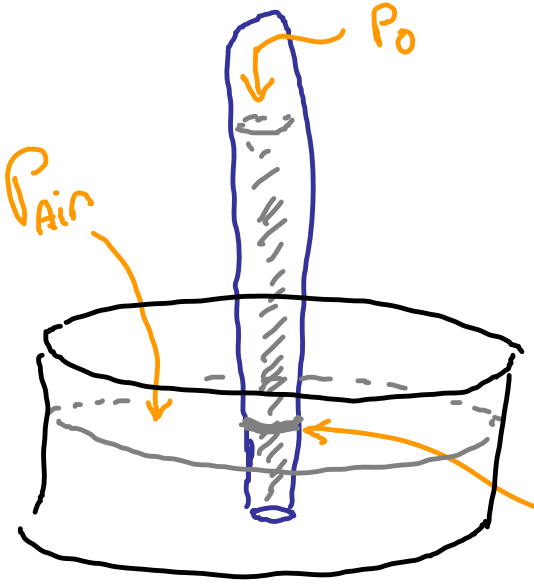
Pa = Pascal

Pascal's Law

Pressure applied to an enclosed fluid is transmitted undiminished to every point in the fluid and container walls.

1 atmosphere
$= 1.013 \times 10^5$ Pa
$= 1013$ millibars
$= 14.7$ lb/in^2





Pressure = 1 Torr ≡ 1 mm Hg

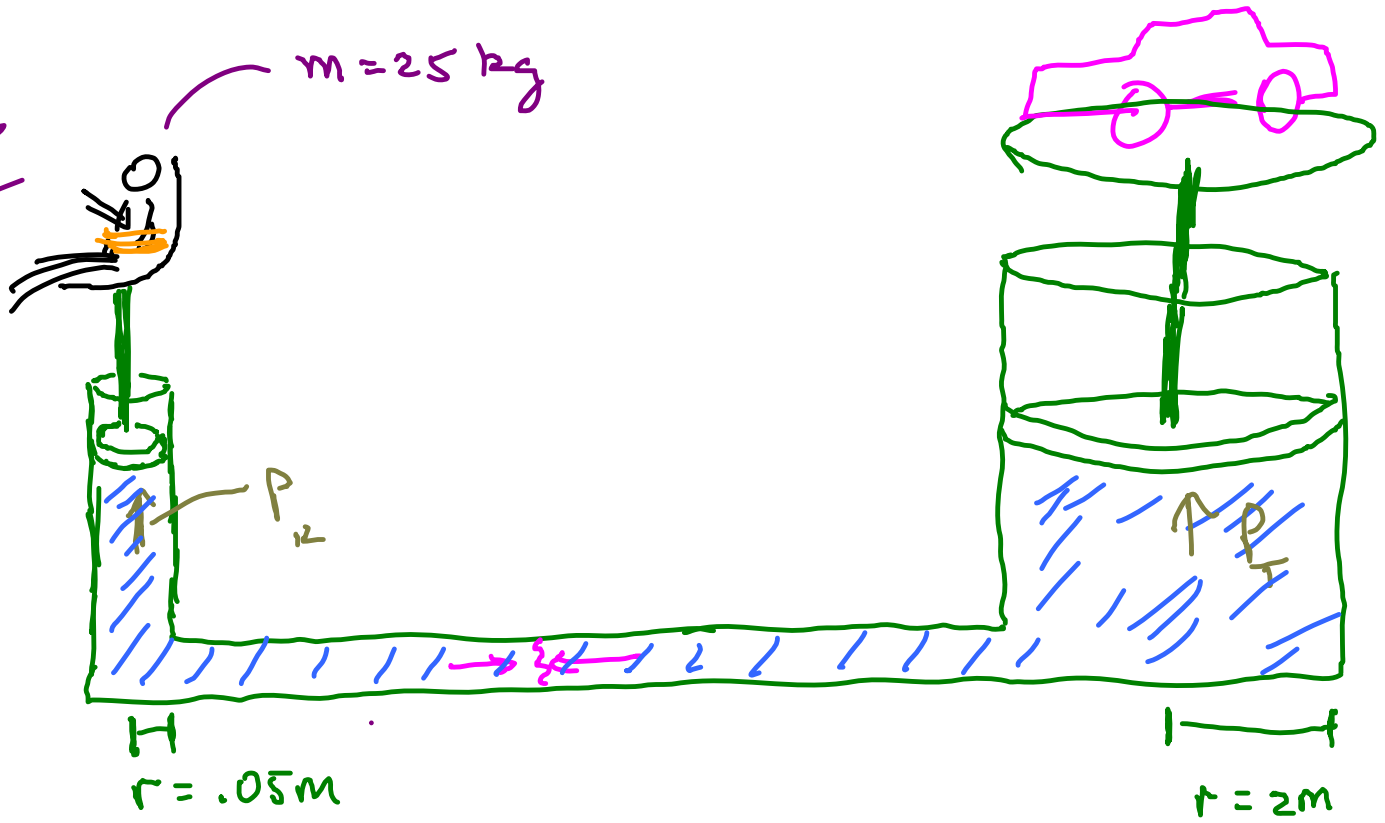
1 atm = 760 torr = 760 mm Hg

$P_{Air} = \rho g h$

(correction for P_0)

$P_0 = 0$

Hydraulics



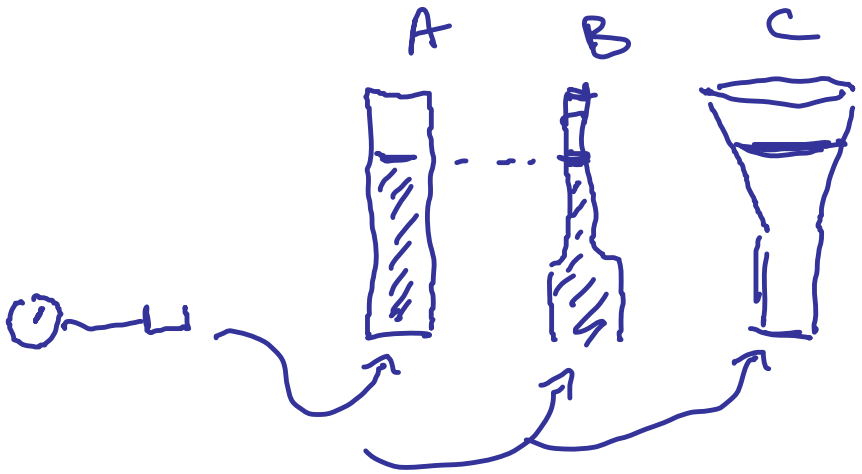
$$P_K = P_T$$

$$\frac{F_K}{A_K} = \frac{F_{Truck}}{A_T}$$

$$\frac{(25)(g)}{\pi (.05)^2} = \frac{M_T g}{\pi 2^2}$$

$M_T = 40{,}000$ kg

$\sim 80{,}000$ lbs



Which one

↳ longest Pressure

I A

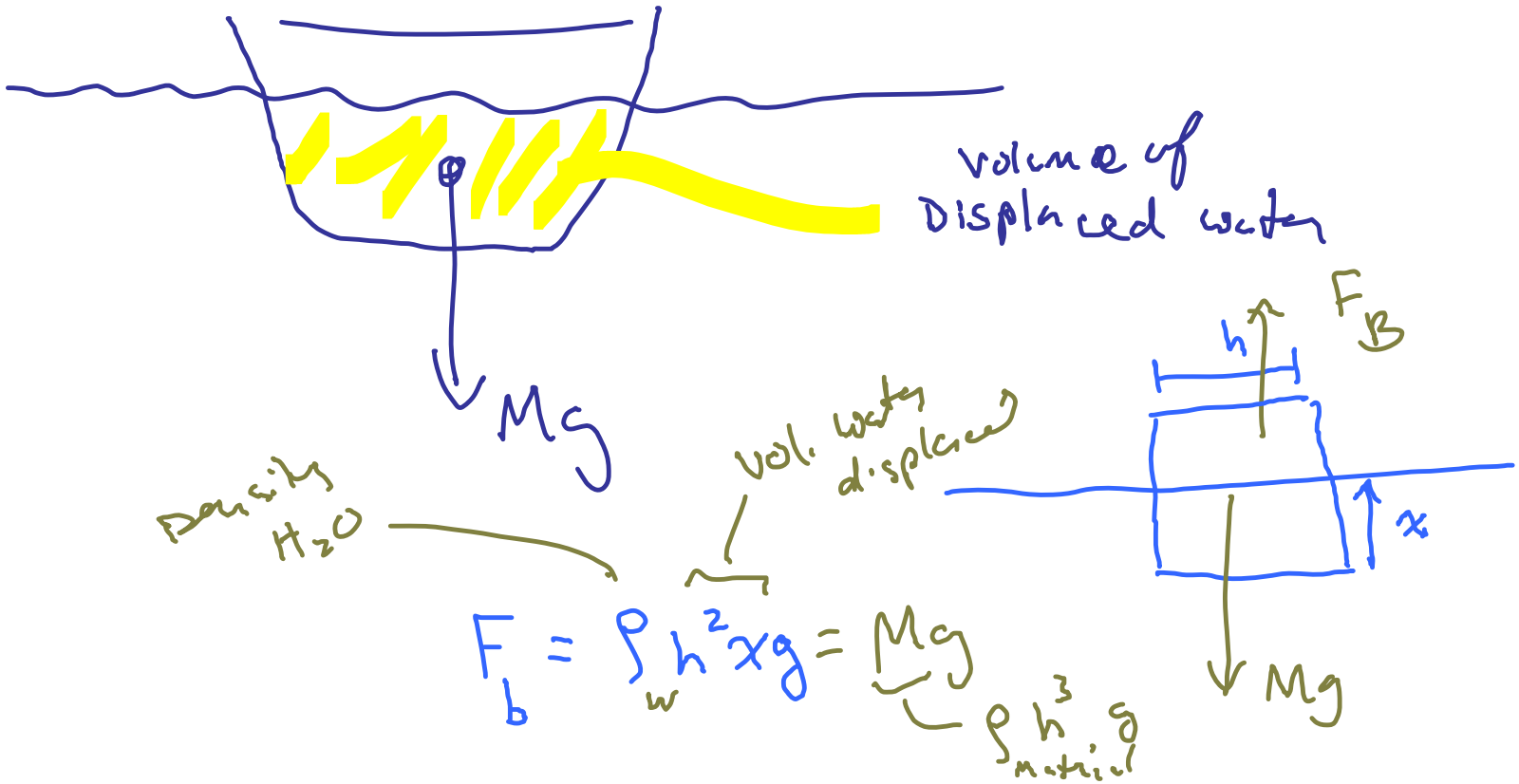
II B

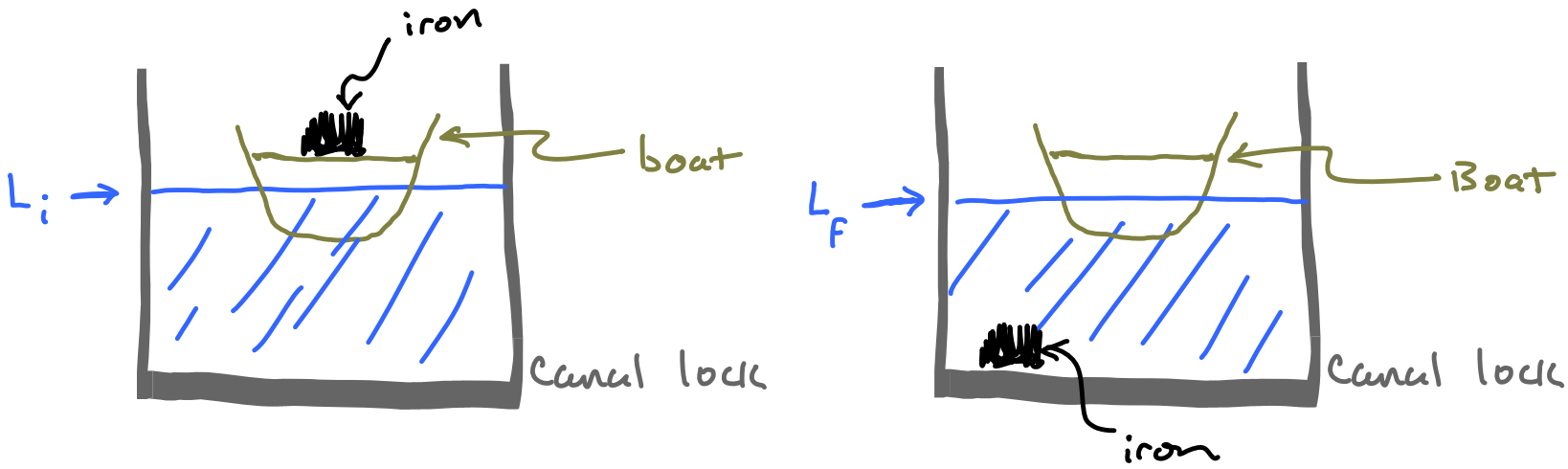
III C

IV All the same

Archimede's Principle

When a body is completely or partially submersed, the fluid exerts an upward force on the body equal to the weight of the displaced fluid.


volume of
Displaced water
Mg
Density
H_2O
vol. water
displaced
$F_b = \rho_w h^2 x g = Mg$
$\rho_{material} h^3 g$
F_B
h
x
Mg



(a) Water level unchanged

(b) Water level rises ($L_f > L_i$)

(c) Water level Drops ($L_f < L_i$)