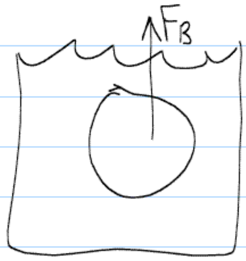
PHY131 - Class 23 - Mon. Dec. 5, 2011

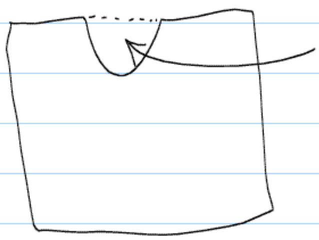


$F_B = \rho_f V_f g$

submerged object: $V_f = V_o$

V_f = volume of displaced fluid
V_o = volume of object.

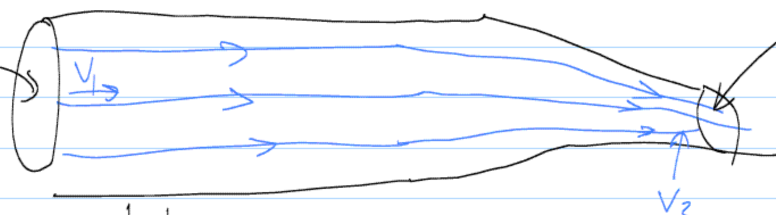
Floating object:



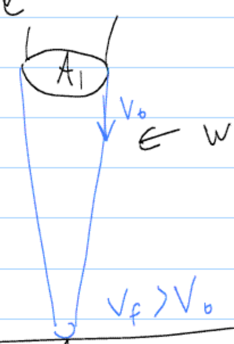
V_f = volume of fluid displaced.

Ideal Fluid: No turbulence, so flow-lines do not cross

cross-section area A_1



tube

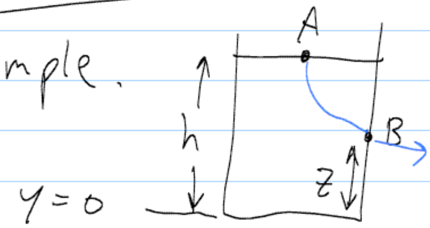


← water accelerates at $9.8\ m/s^2$

$Q_f = Q_o$

$A_2 < A_1$

A Bernoulli Example.



$V_B = ?$

- Approximate $V_A = 0$, since Area of cylinder is $\gg$ area of hole.

- $P_A \approx P_B = P_{atm}$.

Bernoulli's Eq:

$$\cancel{P_A} + \cancel{\tfrac{1}{2}\rho V_A^2} + \rho g y_A = \cancel{P_B} + \tfrac{1}{2}\rho V_B^2 + \rho g y_B$$

subtract $P_A = P_B$ from both sides.

$$\rho g y_A = \tfrac{1}{2}\rho V_B^2 + \rho g y_B$$

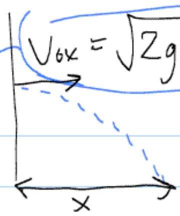
$y_A = h$ = constant. $\quad y_B = z$ = constant.

$$\tfrac{1}{2}\cancel{\rho} V_B^2 = \cancel{\rho} g(h-z)$$

$$V_B = \sqrt{2g(h-z)}$$

Next segment of motion is projectile motion (Ch. 4 review).

$V_{0x} = \sqrt{2g(h-z)}$



find x. $\qquad a_x = 0$

$a_y = -9.8\ m/s^2$

$V_{0y} = 0 \leftarrow$ stream initially is horizontal.

$$y_f = y_0 + \cancel{V_{0y}} t + \tfrac{1}{2} a_y t^2$$

$y_0 = z \qquad y_f = 0$

$$0 = z + 0 + \tfrac{1}{2} a_y t^2$$

$$t^2 = \frac{-2z}{a_y} \qquad t = \sqrt{\frac{-2z}{a_y}}$$

$a_y = -g$

$$t = \sqrt{\frac{2z}{g}}$$

$$x = v_x t = \sqrt{2g(h-z)}\sqrt{\frac{2z}{g}}$$

$$= \sqrt{\frac{4z\cancel{g}(h-z)}{\cancel{g}}}$$

$$x = \sqrt{4z(h-z)}$$ ← Doesn't depend on g!