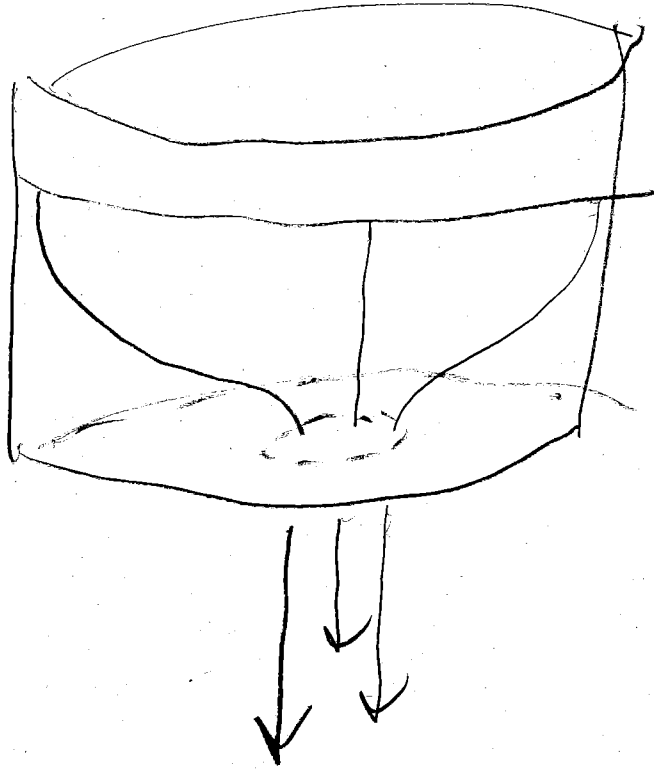
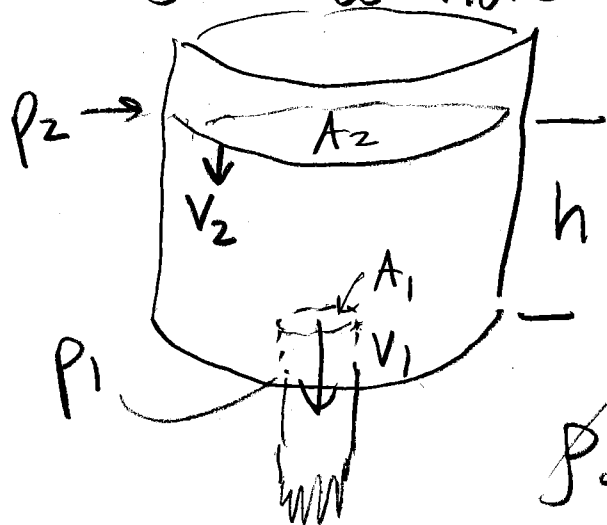


"Stream Line" ... path of
a tiny partle in fluid.



Cut a hole in the bottom...



$p_1 = p_2 !!!$

$v_1 \neq v_2$

$$\rho g y_1 + \frac{1}{2} \rho v_1^2 = \rho g y_2 + \frac{1}{2} \rho v_2^2$$

$$v_1^2 - v_2^2 = 2gh$$

Incompressible

$$A_1 v_1 = A_2 v_2$$

$$v_2 = \left(\frac{A_1}{A_2} \right) v_1$$

$$\left(1 - \left(\frac{A_1}{A_2} \right)^2 \right) v_1^2 = 2gh$$

$$v_1^2 = \frac{2gh}{1 - \left(\frac{A_1}{A_2} \right)^2}$$

As $A_1/A_2 \rightarrow 0,$

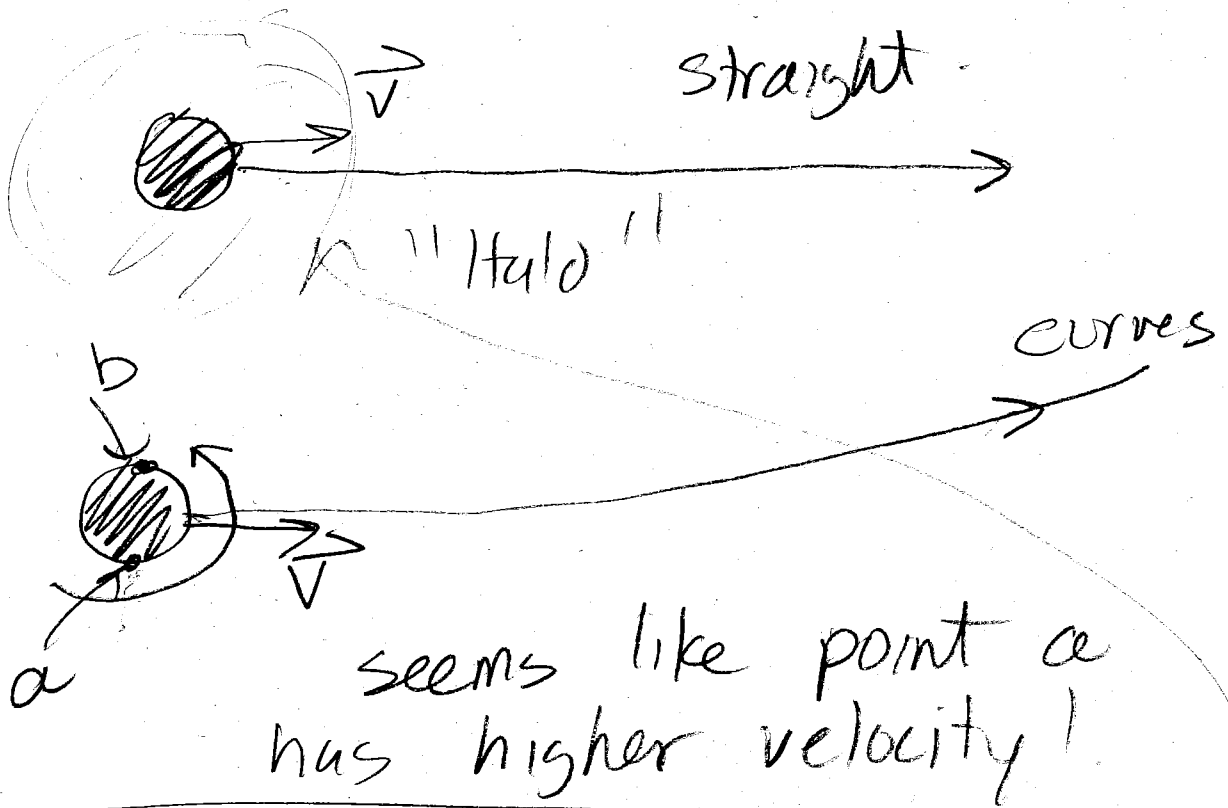
$$v_1^2 \approx 2gh$$

= same speed² a

(Torricelli's Principle) \rightarrow dense object would reach!

Curve balls (ping pong)

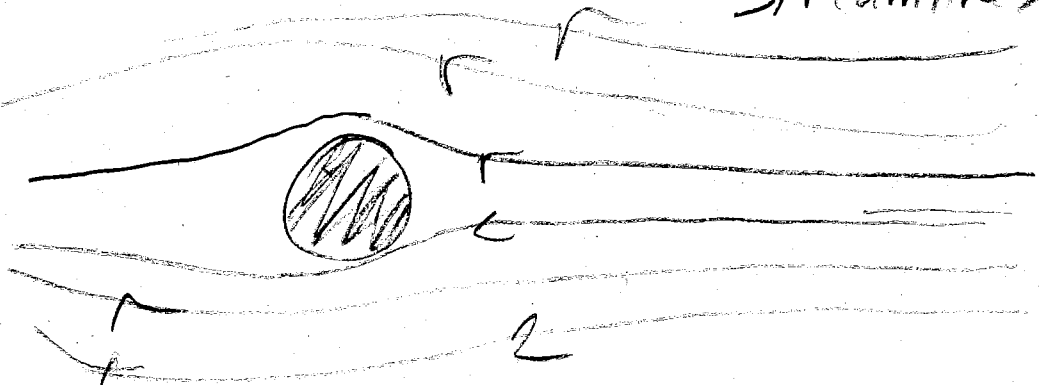
From above:



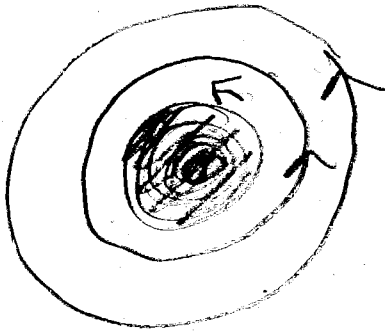
key point: some air is dragged along with ball

Jump into rest frame of ball
streamlines.

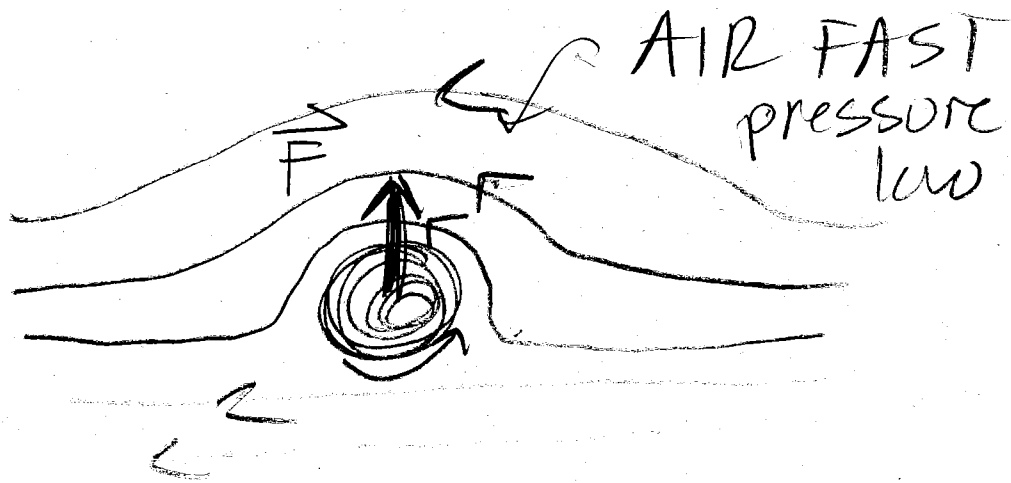
Non Spinning



Ball + air spinning



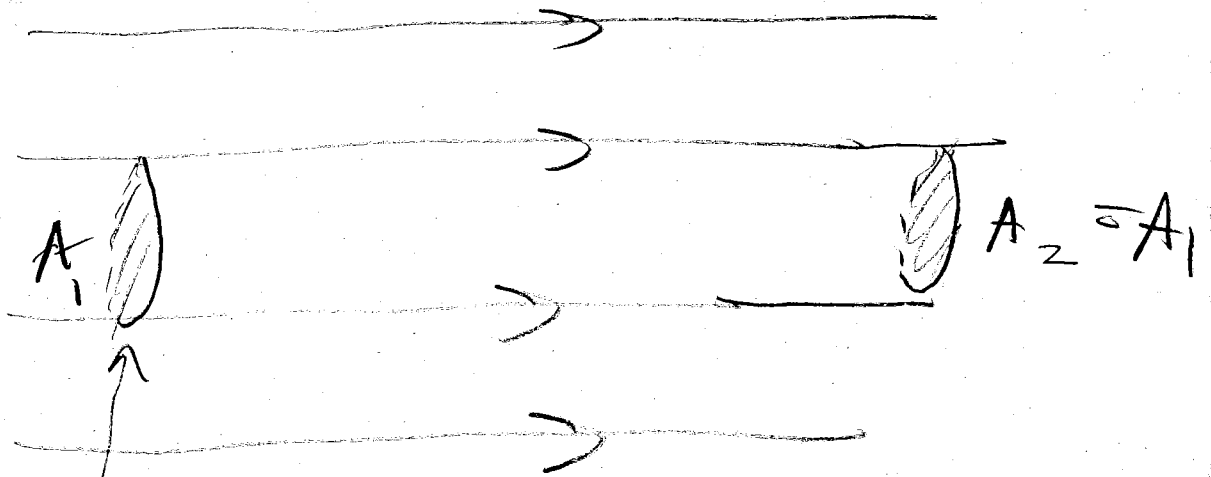
Add the two together
(in the rest frame of ball)



roughening... big effect!

Fields of flow

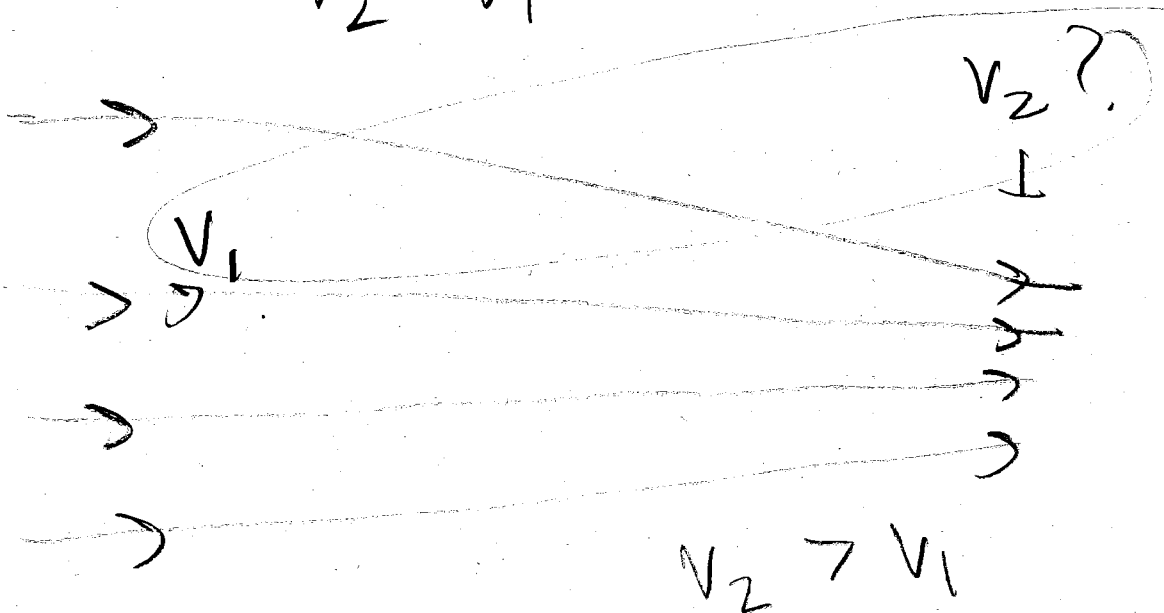
Constant velocity



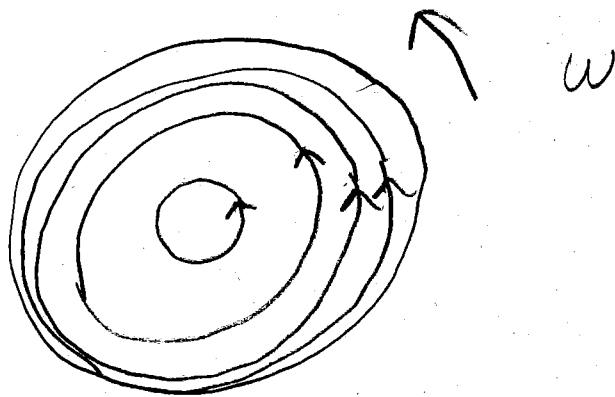
Imagine TRANSVERSE AREA

$$v_1 A_1 = v_2 A_2, \text{ when } A_1 = A_2$$

$$v_2 = v_1$$



Spin a cop . . . $\omega = \frac{v}{R} = \text{constant}$



Down a drain . . .

CENTRAL FORCE

$L = \text{constant!}$

$$L = mvr, \quad v \propto \frac{1}{r}$$

