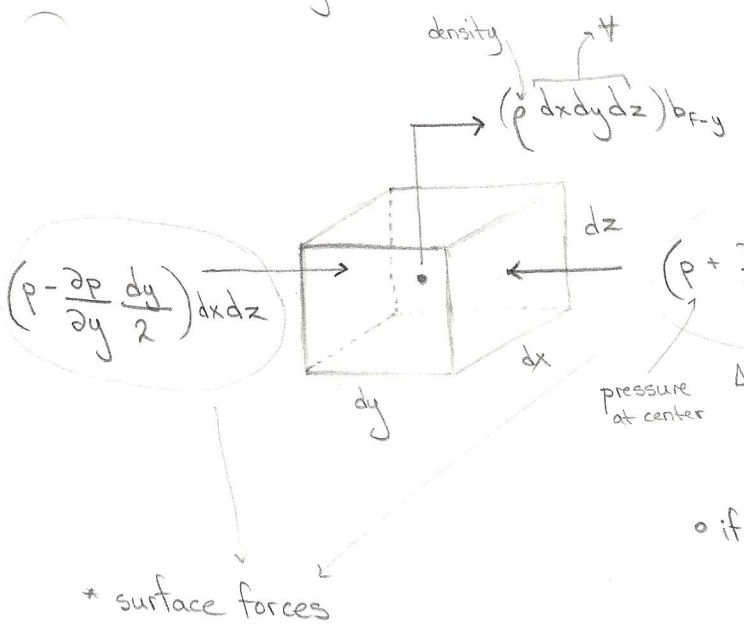
* Looking at the same fluid particle...



- Imagine a point in the middle of the domain with a pressure, p (pressure is a cont. funct. of position b/c treating the fluid as a continuum)
- if you were moving from middle to left face, make dy neg.
- pressure by itself has no direction, pressure acting on a surface has a direction

??? * can have a body force in the y direction and also in the -z direction due to gravity.

* $(\rho\, dx\,dy\,dz)\,b_{f\text{-}y}$ is the body force
  - to find the body force, take the mass of fluid and multiply that by the body force per unit mass
  - $b_{f\text{-}y}$ → body force per unit mass in y direction
    - b/c it is per unit mass, need to mult. by mass
    - to find the mass, mult. ρ by $\forall$

* Apply Newton's 2nd Law in <u>y direction</u> (balance forces)

$$\left(p - \frac{\partial p}{\partial y}\frac{dy}{2}\right)dx\,dz - \left(p + \frac{\partial p}{\partial y}\frac{dy}{2}\right)dx\,dz + \left(\rho\, dx\,dy\,dz\right)b_{f\text{-}y} = \left(\rho\, dx\,dy\,dz\right)a_y$$

surface forces; body force; mass x acceleration

- After some algebra...

$$-\frac{dp}{\partial y} + \rho b_{f\text{-}y} = \rho a_y$$

*** Can do a similar process in x and z direction