Theme Music: Pearl Jam

Even Flow

Cartoon: Bil Watterson
Calvin and Hobbes

Foothold ideas:
Buoyancy

Archimedes’ principle: When an object is immersed in a fluid (in gravity), the result of the fluid’s pressure variation with depth is an upward force on the object equal to the weight of the water that would have been there if the object were not.

As a result, an object whose density is less than that of the fluid will float, one whose density is greater than that of the fluid will sink.

An object less dense than the fluid will float with a fraction of its volume under the fluid equal to the ratio of its density to the fluid’s density.
Foothold ideas: Surface tension

- Due to the intermolecular interactions holding a liquid together, the surface of a liquid experiences a tension.
- The pull across any line in the surface of the liquid is proportional to the length of the line.

\[ F_{\text{surface tension}} = \gamma L \]
Consider a bubble
Now consider its top half
What forces act on it?

\[ \text{Force from pressure inside (up) must cancel pull of surface tension from the bottom half (down).} \]

\[ F_{\text{air pressure inside} \rightarrow \text{top half}} = \frac{1}{2} pA = \frac{1}{2} p(2\pi r^2) = \pi pr^2 \]

\[ F_{\text{s.t. of bot half} \rightarrow \text{top half}} = \gamma L = \gamma(2\pi r) = 2\pi \gamma r \]

\[ p = \frac{2\gamma}{r} \]

From vector averaging

SMALLER bubble has bigger pressure!