Develop a Winning Case Strategy

1

2

3

Pressure function in the fluid $P(x, y, z) = \rho g(H - y)$

$\overrightarrow{dF}$ = Force exerted on the body by the fluid at the infinitesimal surface area $\overrightarrow{dA}$

Let $\overrightarrow{dF_y}$ be the y-component of $\overrightarrow{dF}$ and $\overrightarrow{P} = \rho g(H - y)\hat{j}$

So, $\overrightarrow{dF_y} = -(\overrightarrow{dA} \cdot \overrightarrow{P})\hat{j}$

Magnitude of net buoyant force

$= \oint_A \|\overrightarrow{dF_y}\|$

$= \oint_A -(\overrightarrow{dA} \cdot \overrightarrow{P})$

$= \oint_A (-\overrightarrow{P}) \cdot \overrightarrow{dA}$

$= \oint_V \nabla \cdot (-\overrightarrow{P}) d\tau$ (Divergence Theorem)

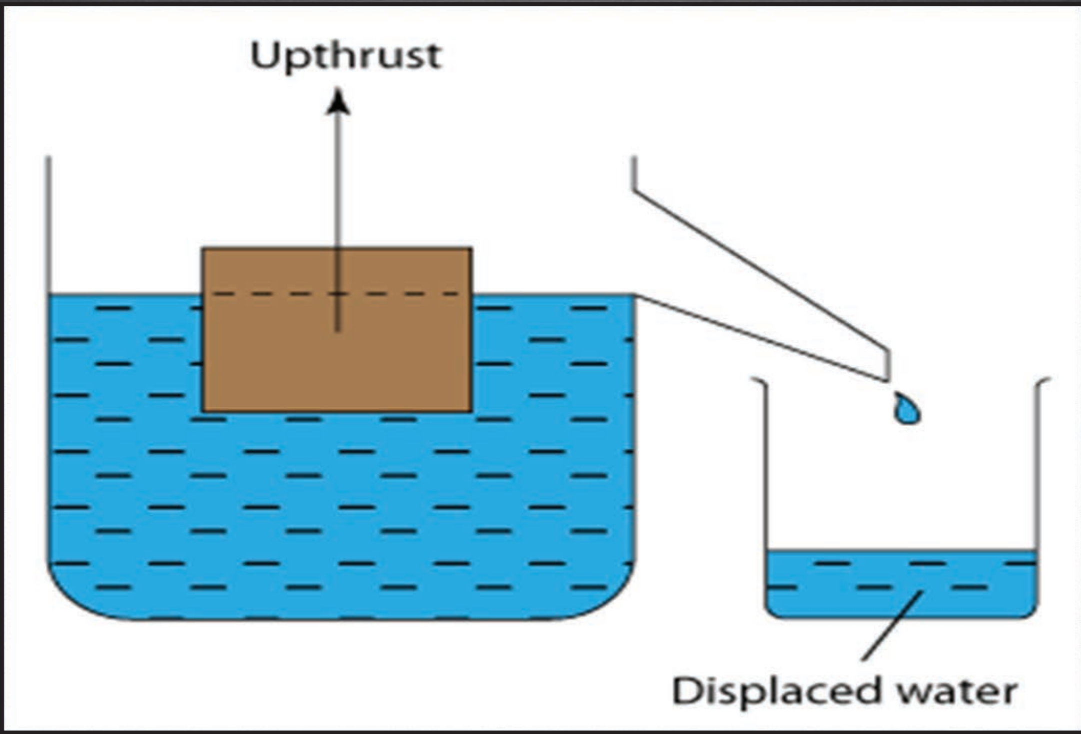
$= \oint_V (\nabla \cdot (-\rho g(H - y)\hat{j})) d\tau$

$= \oint_V (\nabla \cdot (\rho g(y - H)\hat{j})) d\tau$

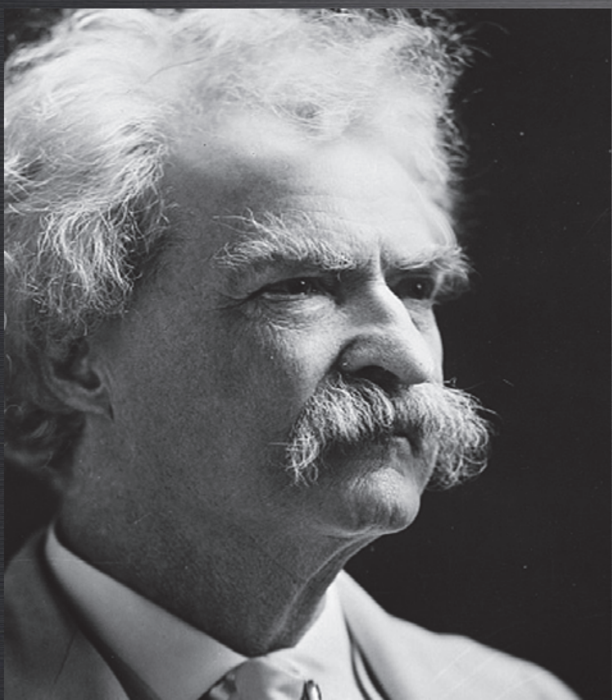
$= \oint_V \rho g d\tau$

$= \rho g V$ = weight of displaced fluid

4



5



“It is easier to manufacture seven facts than one emotion.”

6