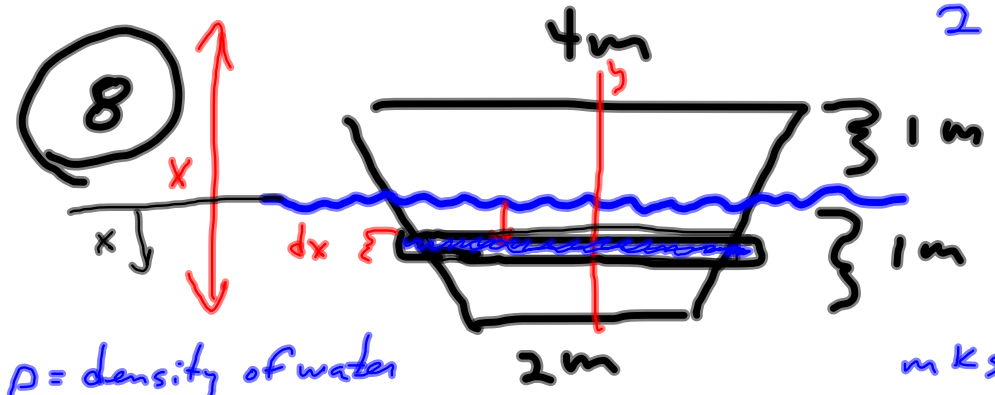
§9.3 #s 9, 10, 14, 17, 24, 26 Bonus Homewor

Physics & Moments / Centroids. Due Dec. 1st 2 HWs



ρ = density of water

mks

Force = mass × Acceleration

= ρ · vol × g

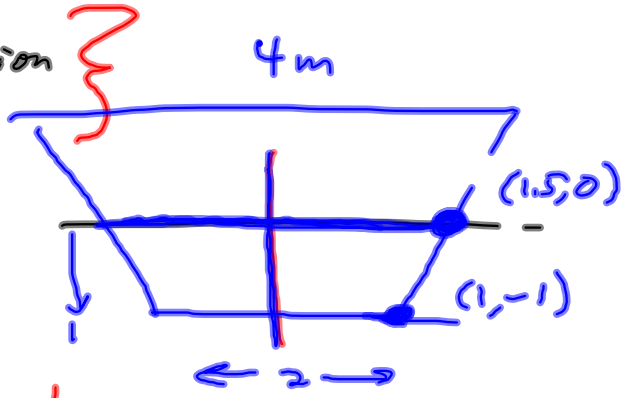
↓

unit volume

$\int \rho g \cdot \text{depth} \cdot \text{Area}$

$= \int \rho g \cdot \text{depth} \cdot \text{width} \cdot dx$

$= \rho g \int x (\quad) dx$



$g(x) = \sqrt{x}\,\sin x = x^{\frac{1}{2}}\sin x$ $\quad$ $x\sin x$

$g'(x) = \frac{1}{2}x^{-\frac{1}{2}}\sin x + x^{\frac{1}{2}}\cos x$

$g''(x) = -\frac{1}{4}x^{-\frac{3}{2}}\sin x + \frac{1}{2}x^{-\frac{1}{2}}\cos x + \frac{1}{2}x^{-\frac{1}{2}}\cos x - x^{\frac{1}{2}}\sin x$

$= \left(-\frac{1}{4}x^{-\frac{3}{2}} - x^{\frac{1}{2}}\right)\sin x + x^{-\frac{1}{2}}\cos x$

$= \left(-\frac{1}{4\sqrt{x^3}} - \left(\frac{x^{\frac{1}{2}}}{1}\right)\left(\frac{4x^{3/2}}{4x^{3/2}}\right)\right)\sin x + \frac{\cos x}{\sqrt{x}}$

$= \left(\frac{4x^2+1}{4x^{3/2}}\right)(\sin x) + \frac{\cos x}{\sqrt{x}}$

$[a,b] = [0,4]$

So, we have $|g''(x)| \le \left|\frac{4x^2+1}{4x^{3/2}}\right||\sin x| + \left|\frac{\cos x}{\sqrt{x}}\right|$

$\le \left|\frac{4x^2+1}{4x^{3/2}}\right| + \left|\frac{1}{\sqrt{x}}\right|$ is unbounded on $[0,4]$, so we don't have a bound on $g''(x)$ with this formulation.

Question is poorly posed.

$\left\{\begin{array}{l} \text{Cpdt} \\ \uparrow \\ \text{Impossible} \end{array}\right.$