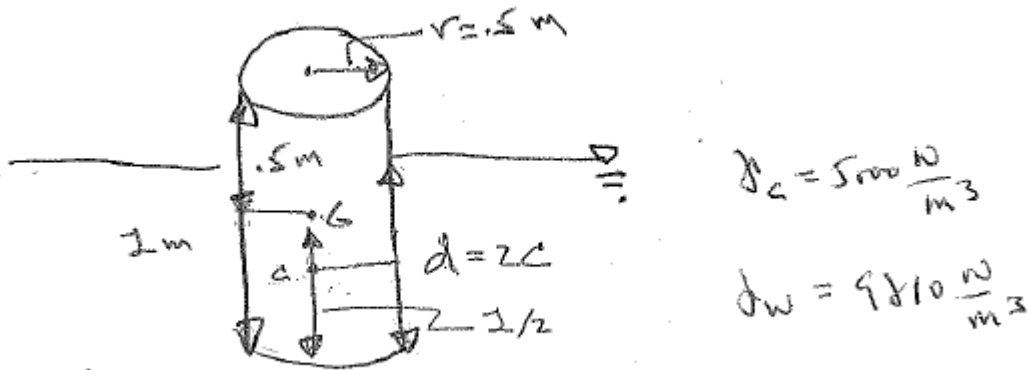


3.137 A cylindrical block of wood 1m in diameter and 1m long has a specific weight of 5000N/m^3 . Will it float in water with the ends horizontal?



Solution:

$$\sum F_v = -W + F_B = 0$$

where

$$W = mg = \rho V_c g = \gamma_c V_c = \gamma_c \times 1 \times A$$

$$F_B = \gamma_w V = \gamma_w d A$$

Therefore

$$d = \gamma_c / \gamma_w = 5000 / 9810 = .5097\text{m}$$

$$V = \pi r^2 d = .4003\text{m}^3$$

$$c = \frac{d}{2} = \frac{.5092}{2}$$

$$CG = .5 - \frac{.5092}{2} = .2452$$

Since

$$GM = \frac{I_{OO}}{V} - CG = \frac{.0491}{.4003} - .2452 = -.1225 < 0 : \text{unstable}$$

where

$$I_{OO} = \frac{\pi r^4}{4} = .0491\text{m}^4$$