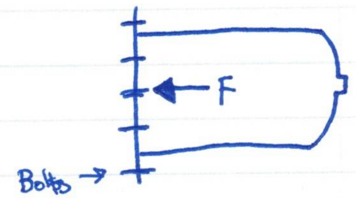
Dynamic HW 2.1

Chapter 4

Diagram



#2) D = 30 in   P = 23.6 psig   Find F:

$P = F/A$

$A = \frac{\pi}{4}(30 in)^2 = 706.86 \; in^2$

$F = P \cdot A$

$F = 23.6 \; psig \, (706.86 \; in^2)$

F = 16681.90 lb

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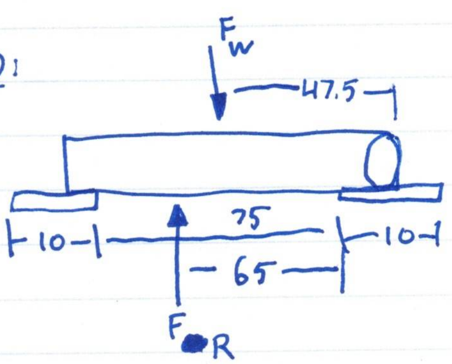
10) Tank diameter = 500 mm
Tank height = 1.8 m
Flap Valve = 75 mm

FBD:



$A = \frac{\pi}{4}(75 + 20)^2 = 7,088.22$

$F_W = \rho g h \times A$

$F_W = (1000)(9.81)(1.8) \times (7,088.22)$

$F_W = 125163788.8 \; N \times 10^{-6}$

$F_W = 125.164 \; kN$

Sum of Moments @ hinge

$F_R \times 65mm - 125.164 \; kN \times 47.5 = 0$

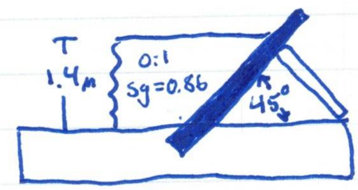
$F_R = 91.47 \; kN$

Chap 4 continued:

Diagram:

17)

$\bar{x} = \frac{1.4m}{2} = 0.7m$



$F_\phi = \rho g h \bar{x}$

$F_\phi = (0.86)(1000)(9.81)\left(\frac{1.4}{\sin 45}\right) \times 4\,(0.7)$

$\boxed{F_\phi = 46770.12\ N}$

$\bar{h} = 2/3\,(1.4)$ cop for 45° $\Delta = 2/3$

$\boxed{\bar{h} = 0.93\ m}$

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28) Where is the force indicated?

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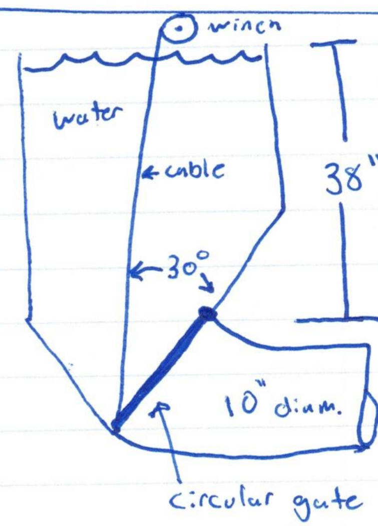
42) $h_c = 38 + \frac{10}{2}\cos 30° = 42.33\ in$



$L_c = 42.33 / \cos 30 = 48.88\ in$

$A_g = \frac{\pi}{4}(10)^2 = 78.5\ in^2$

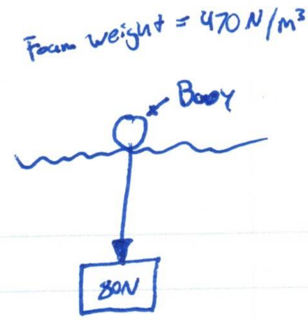
$F_R = (62.4/1728) \times 42.33 \times 78.54 = 120.1\ lb$

$I_c = (\pi/4)(10^4) = 490.9\ in^4$

$L_p = 490.9 / 48.8 \times 78.54 = 0.128\ in$

$F_c = (120.1(5 + 0.128))/5$

$\boxed{F_c = 123.2\ lb}$



Chap 5

8)

$F_b = (1000)(9.81)(10^{-3})$

$F_b = 9.81\,N$

$W_F = 470\,V_F$

$F_{bF} = 9.81 \times 10^3\,V_F$

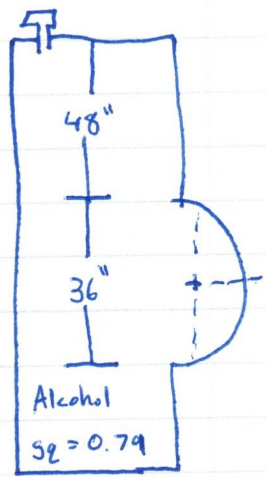
$\Sigma F = 0$

$9.81 \times 10^3 \times V_F + 9.81 - 470\,V_F - 80 = 0$

$$\boxed{V_F = 7.515 \times 10^{-3}\,m^3}$$

Chap 4

54)



$\bar{x} = 48 + 18$

$F_H = 0.79\,(9.81)(60)(36)(66)(0.0254)^3$

$$\boxed{F_H = 18.105\,N}$$

$F_V = 0.79\,(9.81)\left(\frac{\pi\,(18)^2}{2}\right)(60)\,(0.0254)^3$

$$\boxed{F_V = 3.88\,N}$$

$F_R = \sqrt{(18.105^2) + (3.88)^2}$

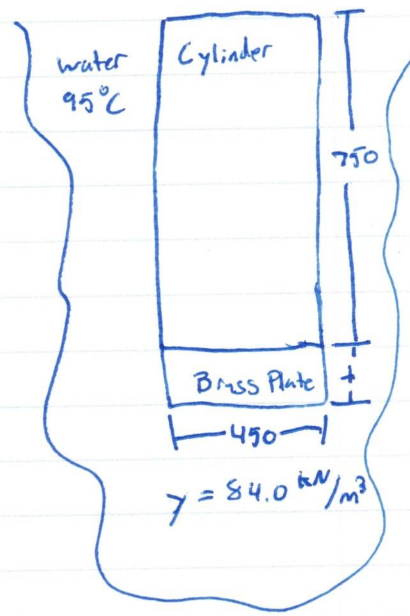
$$\boxed{F_R = 18.52\,N \;@\, 12.09°}$$

$\tan^{-1}\theta = \frac{3.88}{18.105}$

$\theta = 12.09°$

Chap 5

24)



$$W_c = (6.45)\left(\frac{3.14 \times (0.45)^2 \times (0.75)}{4}\right)$$

$$W_c = 0.77\ kN$$

$$W_b = (84)\left(\frac{3.14\,(0.45)^2\,t}{4}\right)$$

$$W_b = 13.36t\ kN$$

$$F_c = (9.44)\left(\frac{3.14}{4}\right)(0.45)^2\,(0.75)$$

$$F_c = 1.125\ kN$$

$$F_b = (9.44)\,\frac{(3.14)\,(0.45)^2\,t}{4}$$

$$F_b = 1.5t\ kN$$

$$1.5t + 1.125 - 0.77 - 13.36t = 0$$

$$t = \frac{0.355}{11.86}$$

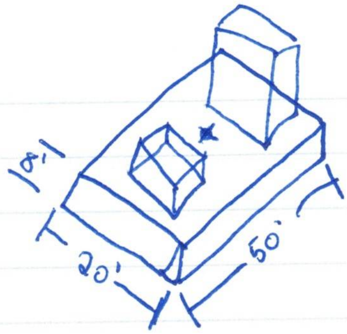
$$\boxed{t_b = 30\ mm}$$

Chap 5

41)

$450{,}000 = 64 \times 20 \times 50 \times h$

$h = 7.03125$ ft



$AB = \frac{7.03125 \text{ ft}}{2} = 3.51563$ ft

$AG - AB = 8 - 3.51563$ ft
$= 4.48437$ ft

$I = \frac{50 \times 20^3}{12} = 33333.33 \text{ ft}^4$

$V = 20 \times 50 \times 7.03125 = 7031.25 \text{ ft}^3$

$GM = \frac{33333.33}{7031.25} - 4.48437 = 0.2563$ ft

point M lies above poin G so the system is stable

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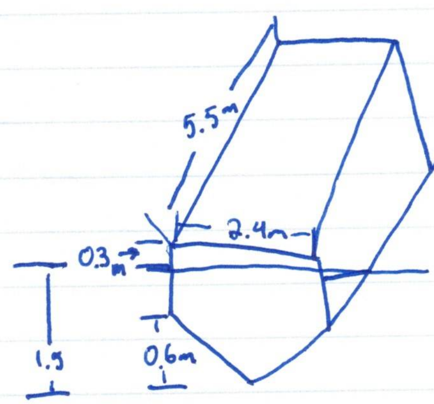
61)

$Y_{cG} = \frac{20.592}{19.8} = 1.04$ m

$Y_{cB} = \frac{15.84}{14.058} = 0.8875$ m

$M_B = \frac{6.336}{15.84} = 0.4$ m

$Y_{mc} = 0.8875 + 0.4 = 1.2875$



$Y_{mc} > Y_{cG}$, so the boat is stable