

Becca Sopher

Homework 1.3

Due: 9.19.2017

$\rho_{oil} = 1.746$

specific gravity of oil $\rightarrow 0.90 = \frac{\gamma_{oil}}{\gamma_w}$

point A = $180 \frac{lb}{in^2}$
change in elevation $64in = 5.3ft$

$0.90 = \frac{\gamma_{oil}}{62.4 \frac{lb}{ft^3}}$

$\gamma_{oil} = 56.16 \frac{lb}{ft^3}$

$\Delta P_{A-s} = 180 \text{ psig} - (56.16 \frac{lb}{ft^3})(5.3ft)$

$= 180 \text{ psig} - \frac{297.648 \text{ lb}}{ft^2} \cdot \frac{1ft}{12in} \cdot \frac{1ft}{12in}$

$\frac{180 \text{ lb}}{in^2} - 2.067 \frac{\text{lb}}{in^2}$

pressure at surface P_s

$= 177.9 \text{ psig}$

3.41

3.83 A barometer indicates the atmospheric pressure to be 27.56 in of mercury. Calculate the atmospheric pressure in psia.

$$\gamma_m h = p_{\text{atm}}$$

$$\gamma_m = 848.7 \text{ lb/ft}^3$$

$$h = 27.56 \text{ in}$$

$$p_{\text{atm}} = \left(\frac{848.7 \text{ lb}}{\text{ft}^3} \right) \left(\frac{27.56 \text{ in}}{1} \right) \left(\frac{1 \text{ ft}^3}{1728 \text{ in}^3} \right) = \boxed{13.54 \text{ lb/in}^2}$$

3.90 The pressure in a vacuum chamber is -98.2 kPa . Express this pressure in mmHg.

$$1.0 \text{ mmHg} = 133.3 \text{ Pa} \quad 133.3 \text{ Pa} \cdot \frac{1 \text{ kPa}}{1000 \text{ Pa}} = 0.1333 \text{ kPa}$$

~~$$133.3 \text{ Pa}$$~~

$$\frac{1.0 \text{ mmHg}}{0.1333} = \frac{0.1333 \text{ kPa}}{0.1333}$$

$$= 1 \text{ kPa}$$

$$7.501875 \text{ mmHg} = 1 \text{ kPa}$$

$$-98.2 \times 7.501875 = \boxed{-736.68 \text{ mmHg}}$$

3.94 Passive solar water heater to be installed on roof of building.

4.2 The flat left end of the tank is secured with a bolted flange. If the inside diameter of the tank is 30 in & the internal pressure is raised to $+24.4$ psig, calculate the total force that must be resisted by the bolts in the flange.

$$F = pA \quad F = \left(\frac{24.4 \text{ lb}}{\text{in}^2} \right) \left(\pi (15 \text{ in})^2 \right)$$

$F = 17,247.34 \text{ lb}$