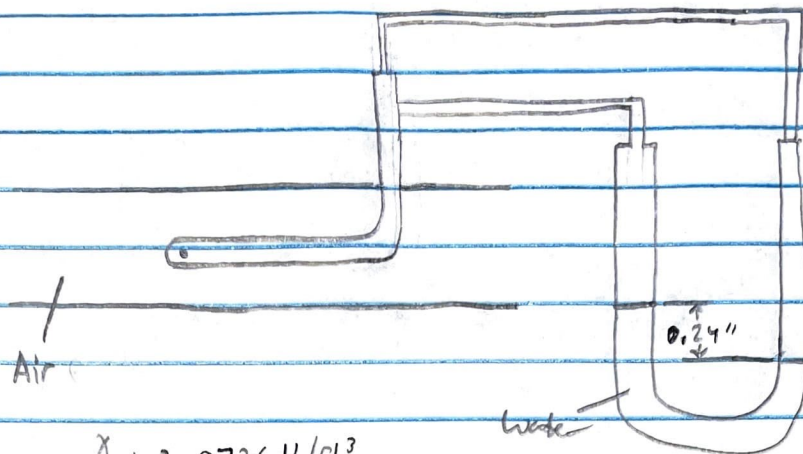


Common Sutton

HW 2.3

15.15) Given:



$$P = \text{atm}$$

$$\gamma_{\text{air}} = .0736 \text{ lb/ft}^3$$

$$T = 80^\circ\text{F}$$

$$\gamma_{\text{water}} = 62.2 \text{ lb/ft}^3$$

$$F = \text{air}$$

$$h = 0.24 \text{ in} = .002 \text{ ft}$$

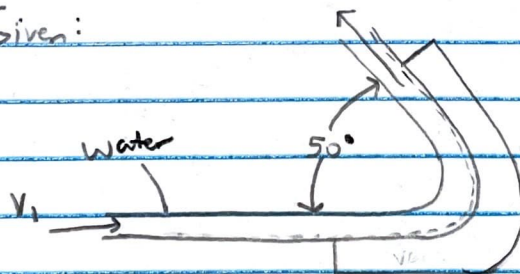
Determine: Velocity of flow.

$$\text{Solution: } v_1 = \sqrt{2gh(\gamma_g - \gamma)/\gamma}$$

$$v_1 = \sqrt{2(32.2)(0.02)((62.2 - .0736)/.0736)}$$

$$v_1 = 32.97 \text{ ft/s}$$

16.6) Given:



Water at 180°F

$$v_1 = 22.0 \text{ ft/s}$$

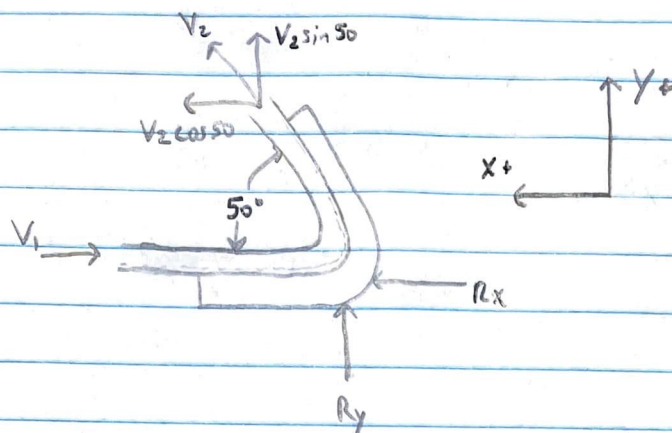
$$A = 2.95 \text{ in}^2$$

$$\gamma = 60.6 \text{ lb/ft}^3$$

Determine: Vertical and horizontal forces exerted on vane.

Solution:

FBD:



$$V_1 = V_2$$

$$Q = VA = (22 \text{ ft/s})(0.0204 \text{ ft}^2) = .451 \text{ ft}^3/\text{s}$$

$$\rho_w = 1.88 \text{ slugs/ft}^3$$

$$\begin{aligned}\Sigma F_x &= \rho Q (V_{2x} - V_{1x}) \\ &= 1.88 (.451) (22 \cos 50 + 22) \\ &= 30.67 \text{ lb}\end{aligned}$$

$$\begin{aligned}\Sigma F_y &= \rho Q (V_{2y} - V_{1y}) \\ &= 1.88 (.451) (22 \sin 50) \\ &= 17.29 \text{ lb}\end{aligned}$$