2.81 A 2-ft-diameter hemispherical plexiglass "bubble" is to be used as a special window on the side of an above-ground swimming pool. The window is to be bolted onto the vertical wall of the pool and faces outward, covering a 2-ft-diameter opening in the wall. The center of the opening is 4 ft below the surface. Determine the horizontal and vertical components of the force of the water on the hemisphere.

$$\Sigma F_x = 0, \text{ or } F_H = F_R = p_c A$$

Thus,

$$F_H = \gamma h_c A = 62.4 \frac{lb}{ft^3} (4 ft) \frac{\pi}{4} (2 ft)^2 = \underline{784 \, lb} \text{ (to right)}$$

and

$$\Sigma F_y = 0, \text{ or } F_V = W = \gamma V = \gamma \frac{4}{3} \pi R^3 / 2,$$

where $R = 1 \, ft$

Thus,

$$F_V = 62.4 \frac{lb}{ft^3} (4 \pi (1 ft)^3 / 6) = \underline{131 \, lb} \text{ (down on bubble)}$$