1.87 An open, clean glass tube, having a diameter of 3 mm, is inserted vertically into a dish of mercury at 20 °C. How far will the column of mercury in the tube be depressed?

\[ h = \frac{2\sigma \cos \theta}{\gamma R} \]  

(Eq. 1.22)

For \( \theta = 130^\circ \),

\[ h = \frac{2 \times (4.66 \times 10^{-1} \text{ N/m}) \cos 130^\circ}{(133 \times 10^3 \text{ N/m}^2)(0.0015 \text{ m})} = -3.00 \times 10^{-3} \text{ m} \]

Thus, column will be depressed \( 3.00 \text{ mm} \)

1.88 An open, clean glass tube \((\theta = 0^\circ)\) is inserted vertically into a pan of water. What tube diameter is needed if the water level in the tube is to rise one tube diameter (due to surface tension)?

\[ h = \frac{2\sigma \cos \theta}{\gamma R} \]  

(Eq. 1.22)

For \( h = 2R \) and \( \theta = 0^\circ \)

\[ 2R = \frac{2\sigma (1)}{\gamma R} \]

and

\[ R^2 = \frac{\sigma}{\gamma} = \frac{5.03 \times 10^{-3} \text{ lb}}{62.4 \text{ lb/ft}^2} \]

\[ R = 8.98 \times 10^{-3} \text{ ft} \]

Diameter = \( 2R = 1.80 \times 10^{-2} \text{ ft} \)