

Problem 3

(a)

$$\sigma = 0.072 \frac{N}{m}$$

$$\rho = 997.05 \frac{kg}{m^3}$$

$$d = 8.0 \cdot 10^{-6}$$

$$r = 4.0 \cdot 10^{-6}$$

$$g = 9.81 \frac{m}{s^2}$$

For a perfectly wetting fluid, λ is small and $\cos(\lambda) \simeq 1$
So for this problem we will set $\cos(\lambda) = 1$

$$h_c = \frac{2\sigma \cos(\lambda)}{\rho g r} = \frac{2(0.072)(1)}{(997.05)(9.81)(4.0 \cdot 10^{-6})}$$

$$h_c = 3.68 \text{ m}$$

(b)

$$\sigma = 0.072 \frac{N}{m}$$

$$\rho = 997.05 \frac{kg}{m^3}$$

$$d = 8.0 \cdot 10^{-6}$$

$$r = \text{unknown}$$

$$g = 9.81 \frac{m}{s^2}$$

$$h_c = 0.75 \text{ m}$$

For a perfectly wetting fluid, λ is small and $\cos(\lambda) \simeq 1$
So for this problem we will set $\cos(\lambda) = 1$

$$h_c = \frac{2\sigma \cos(\lambda)}{\rho g r}$$

$$r = \frac{2\sigma \cos(\lambda)}{\rho g h_c} = \frac{2(0.072)(1)}{(997.05)(9.81)(0.75)}$$

$$r = 1.96 \cdot 10^{-5} \text{ m}$$