

25. (a) Using Eq. 37-14, the angular separation is

$$\theta_R = \frac{1.22\lambda}{d} = \frac{(1.22)(550 \times 10^{-9} \text{ m})}{0.76 \text{ m}} = 8.8 \times 10^{-7} \text{ rad} .$$

- (b) Using the notation of Sample Problem 37-6 (which is in the textbook supplement), the distance between the stars is

$$D = L\theta_R = \frac{(10 \text{ ly})(9.46 \times 10^{12} \text{ km/ly})(0.18)\pi}{(3600)(180)} = 8.4 \times 10^7 \text{ km} .$$

- (c) The diameter of the first dark ring is

$$d = 2\theta_R L = \frac{2(0.18)(\pi)(14 \text{ m})}{(3600)(180)} = 2.5 \times 10^{-5} \text{ m} = 0.025 \text{ mm} .$$