17. Astronomers have discovered a planetary system orbiting the star Upsilon Andromedae, which is at a distance of 4.2 x 10^{17} m from the earth. One planet is believed to be located at a distance of 1.2 x 10^{11} m from the star. Using visible light with a vacuum wavelength of 550 nm, what is the minimum necessary aperture diameter that a telescope must have so that it can resolve the planet and the star?

$$\theta_{minimum} = \frac{1.22\,\lambda}{D} \approx \frac{y}{L}$$

Solve for the diameter

$$D = \frac{1.22\,\lambda L}{y} = \frac{1.22\,(550\,x\,10^{-9} m)(4.2\,x\,10^{17} m)}{1.2\,x\,10^{11} m} = 2.349\,m$$

$$\boxed{D = 2.3\,m}$$

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