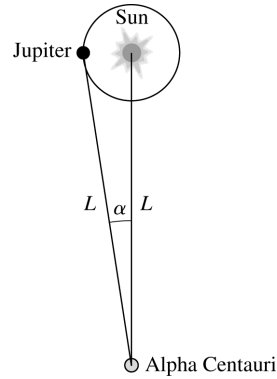


23.74. Model: Two objects are marginally resolved if the angular separation between the objects is $\alpha = 1.22\lambda/D$.

Visualize:



Solve: (a) The angular separation between the sun and Jupiter is

$$\alpha = \frac{780 \times 10^9 \text{ m}}{4.3 \text{ light years}} = \frac{780 \times 10^9 \text{ m}}{4.3 \times (3.0 \times 10^8) \times (365 \times 24 \times 3600) \text{ m}} = 1.92 \times 10^{-5} \text{ rad}$$

$$\alpha = \frac{1.22\lambda}{D} = \frac{1.22(600 \times 10^{-9} \text{ m})}{D} \Rightarrow D = 0.038 \text{ m} = 3.8 \text{ cm}$$

(b) The sun is vastly brighter than Jupiter, which is much smaller and seen only dimly by reflected light. In theory it may be possible to resolve Jupiter and the sun, but in practice the extremely bright light from the sun will overwhelm the very dim light from Jupiter.