Use the Planck function and known facts about Vega (alpha Lyra) to determine it's radius.

Known facts:

Effective Temperature $T_e := 9900 \cdot K$

From its spectral type (A0) and Cecilia Payne-Gaposhkin's calibration of spectral types

Parallax $p := 0.129 \cdot \text{arcsec}$

From Hipparchos via the SIMBAD Astronomical Database, this immediately gives the distance:

$$d := \frac{pc}{\left(\frac{p}{\text{arcsec}}\right)} \qquad d = 7.752\,pc$$

Vega is zero magnitudes at all wavelengths, therefore it's flux is that of a star of zero mag. From handout #2, I gave the V-band zero mag flux as

$$F_V := \frac{10^3 \cdot \frac{\text{photon}}{s}}{cm^2 \cdot \text{Angstrom}}$$

The central wavelength of the V-band is $\lambda_V := 5500 \cdot \text{Angstrom}$

So the energy of one photon is $\text{photon} := h \cdot \frac{c}{\lambda_V}$

and

$$F_V := \frac{10^3 \cdot \frac{\text{photon}}{\text{sec}}}{cm^2 \cdot \text{Angstrom}} \qquad F_V = 3.604 \times 10^{-12} \frac{W}{cm^2 \cdot \mu m}$$

The Planck function:

$$B_\lambda(\lambda, T) := 2 \cdot h \cdot c^2 \cdot \left[\frac{1}{\lambda^5 \cdot \left(\exp\left(\frac{h \cdot c}{\lambda \cdot k \cdot T}\right) - 1\right)}\right]$$

Use this to determine the solid angle of Vega:

$$\Omega_{Vega} := \frac{F_V}{B_\lambda(\lambda_V, T_e)} \qquad \Omega_{Vega} = 0.199\,10^{-15} \cdot \text{ster}$$

The solid angle subtended by a sphere of radius R at distance d is given by: $\Omega = \frac{\pi \cdot R^2}{d^2}$

So the radius of Vega is:

$$R_{Vega} := \sqrt{\frac{\Omega_{Vega} \cdot d^2}{\pi}} \qquad R_{Vega} = 1.908 \times 10^{11}\,cm$$

or $R_{Vega} = 2.725\,R_{sun}$

Which compares favorably with the radius of an A0 main sequence star from Appendix E of Carroll and Ostlie (2.7 solar radii)

NEEDED CONSTANTS

$\mu m \equiv 10^{-6} \cdot m$ $\quad$ $\text{Angstrom} \equiv 10^{-8} \cdot cm$ $\quad$ $\text{arcsec} \equiv \frac{\pi}{180 \cdot 60 \cdot 60} \cdot \text{rad}$ $\quad$ $\text{ster} \equiv 1$ $\quad$ $W \equiv \frac{\text{joule}}{\text{sec}}$

$c \equiv 2.99 \cdot 10^{10} \cdot \frac{cm}{\text{sec}}$ $\quad$ $k \equiv 1.38 \cdot 10^{-16} \cdot \frac{\text{erg}}{K}$ $\quad$ $h \equiv 6.63 \cdot 10^{-27} \cdot \text{erg} \cdot \text{sec}$

$AU \equiv 150 \cdot 10^6 \cdot km$ $\quad$ $pc \equiv \frac{AU}{\text{arcsec}}$ $\quad$ $pc = 3.094 \times 10^{18}\,cm$ $\quad$ $R_{sun} \equiv 7 \cdot 10^{10} \cdot cm$