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Homework 1

All calculations can be found in the notebook .

2.3 (a) A distance of 470 ly gives τ Sco a distance modulus of 5.79 mag, which means that its M_V is -2.99 mag.

(b) With a bolometric correction of -3.16 mag, the bolometric magnitude is $M_{\rm bol} = -6.15$ mag, giving a luminosity of 2.28×10^4 $L_\odot$.

(c) From the Stefan-Boltzmann equation, the radius of the star is 5.59 $R_\odot$.

(d) Using the relation $L/L_\odot = 1.5(M/M_\odot)^{3.5}$, we find a mass of 15.65 $M_\odot$.

(e) The surface gravity of the star is 1.37×10^4 cm s^{-2} ($\log g = 4.13$), and the escape velocity is 1.03×10^8 cm s^{-1}.

(f) The mean density is $\rho = 0.12$ g cm^{-3}.

(g) The surface gravity of τ Sco is about half that of the sun, whereas the escape velocity is about 1.67 times solar. τ Sco's mean density is only 0.09 of solar.

3.4 (a)

4.3 (a)

5.2 (a)

6.2 (a)

7.3 (a)