

Homework 04

Problem 1 (5 points)

Find the required precision of the star speed measurement to detect Mars like planet around Sun like star at the distance of 1.4 AU.

Problem 2 (5 points)

Solve problem 7.6 from the textbook (Binary star parameters).

Problem 3 (5 points)

Observation of a binary system yields that one of the star is moving along an ellipse like orbit in xy plane. The observed ellipse is stretched along x axis with apparent values of the semimajor axis $a' = 1.9803$ AU and the semiminor axis $b' = 0.3473$ AU. A careful observation of both stars yields the location of the center of mass at position $x_{c.m.} = 0$ AU and $y_{c.m.} = 0.04862$ AU with respect to the center of the observed ellipse.

Find the real eccentricity, semimajor axis a , and the inclination angle. Assume that the real semiminor axis direction is orthogonal to the line of sight. Note: the observed data has uncertainty.

Problem 4 (5 points)

The first star has apparent magnitude $m_1 = 12$ and the peak wavelength of the radiation spectrum at $\lambda_1 = 600$ nm, it is located at distance $d_1 = 145$ pc from us. The second star has absolute magnitude $M_2 = 6$ and its temperature is $T_2 = 3400$ K. Find the ratio of stars radii R_1/R_2 . Additionally, express the radius of each star in the units of the Sun radius.

Problem 5 (5 points)

Solve problem 3.12 from the textbook (derivation of Wein's displacement law).