ASTR 558

Exoplanets, Spring 2022 -Prof. Agol

Problem Set 2

Due: May 2, 2022

1. Derive a formula for the overlap area of two circles as a function of their separation and radii. You need the formulae for the area of a triangle in terms of the length of the three sides (Heron's formula), the law of cosines to derive the angles of intersection, and the area of a sector of a circle in terms of its angle. [2 pt]

2. Write a function to compute the transit/secondary eclipse of a body without limb-darkening. [4 pt]

3. Using layer-cake prescription, call uniform transit code multiple times to produce a limb-darkened transit with arbitrary limb-darkening profile (see 'batman' Kreidberg 2015). [4 pt]

4. Use your model to fit the data 'mystery_planet02.txt' (note: if you are unsure of the orbital period, try smoothing the data and/or using the periodogram used in the first homework). What is the orbital period in days? What is the depth, impact parameter, and duration of this transiting body? What is the density of the star? [8 pt]