Assignment 5

Remember to number your answers 1a. 1b., etc. so I know which questions you're answering. Be sure to show your work and reasoning for full credit.

1. *(55 points) Two binary stars orbit each other such that to an Earthly observer, their orbit is on the same line (they are right in front of each other). Someone has measured the intensity for a wavelength present in the first star, in Figure 1.*

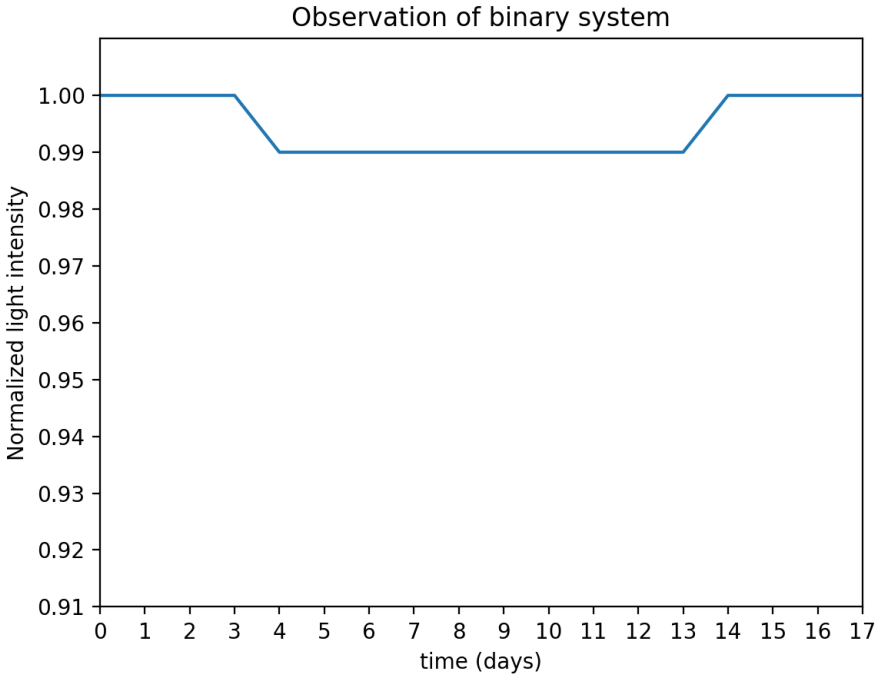

Figure 1: Magnitude of light from a binary star system.

(a) *(5 points) Which star is bigger—the one being eclipsed, or the one eclipsing, or are they the same size? How can you tell?*

(b) *(15 points) Which star is faster? Assuming that the larger star is massive enough that we can approximate it as not moving, what's its velocity?*

(c) *(10 points) What is the relative radius of the smaller star compared to the larger star?*

(d) *(10 points) What is the relative volume of the smaller star compared to the larger star?*

(e) *(15 points) The plot is for a single wavelength emitted by the eclipsed star. Show that the eclipsing star doesn't emit at this wavelength using your previous results.*

2. *(35 points) Showing your work, sort the planets according to their (a) (10 points) volume, (b) (10 points) mass, and (c) (15 points) density. You can use excel to make this faster.*

3. *(20 points) A rock that was known to be made completely of Uranium-238 is observed to be composed of 6.25% Uranium-238, the rest has decomposed to Lead-206. How old is this rock?*