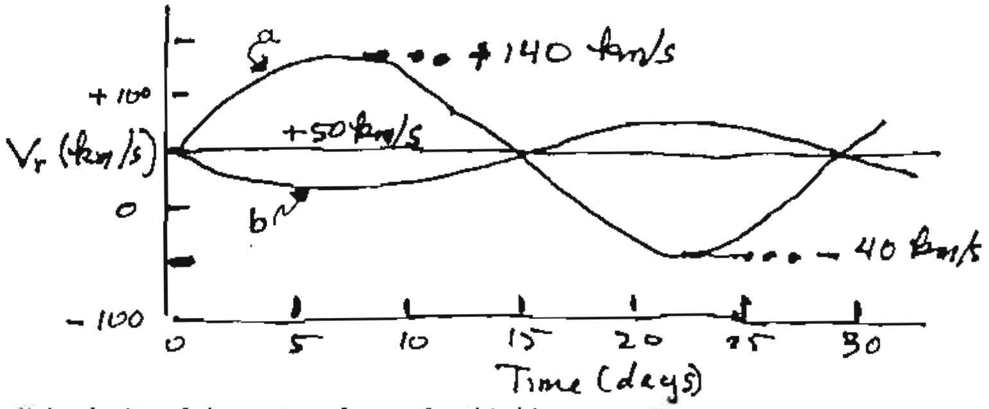
PHYSICS 160: Stellar Structure

Instructor: Dr. A. M. Wolfe (phone: 47435)
Office Hours: Fri. 10-12
Texts: Carrol & Ostlie "An Introduction to Modern Astrophysics",
Homework no. 2
Due: Tues. Oct. 20

1: The following figure shows the radial velocity curves of a double-lines spectroscopic binary star.




(a) Find the radial velocity of the center of mass for this binary system.

(b) Assuming we do not know the inclination angle of the orbit, find lower limits to the mass of each star.

(c) Assuming an inclination angle of 70 deg. find

(i) the masses of each star.

(ii) the orbital radii for each star.

2: In the case of a single-lined spectroscopic binary one can derive only limited information for the binary system. Suppose the top velocity curve (star a) in problem is missing and one can only determine the bottom velocity curve (star b)

(a) Derive eq. 7.7 (Carroll and Ostlie) for the resultant mass function as a function of $(v_b)_r$.

(b)Explain how your result in (a) places a lower limit on on the mass of one of the stars.

(i) which star?

(ii) Derive a lower limit and show it is consistent with results in prob. (1).

(c) Rederive your results in (a) for an average value of $\sin^3(i)$. Hint: to get an average value for sin(i) you need to integrate it over a probability distribution given by the fraction of the sky occupied by a solid angle between $i$ and $i + di$.

3: Carroll & Ostlie prob. 7.4. (To do this problem, you should go over § 7.2, which I covered only briefly.)

4:, 5:, 6: Carroll & Ostlie prob. 8.6. 8.10, 8.14