Homework 4

Due in class Monday, Feb. 21

From the text: 3-7, 3-8

1. To help sharpen your numerical skills, let's consider the motion of one light particle in the presence of two massive ones and assume that the interactions are purely gravitational. Assume all of the bodies are point particles with masses M, M, and m. Take M to be the mass of our sun and m to be the mass of Earth.

Question: Under what conditions is the orbit of m stable? In other words, can a planet have stable orbits in a binary star system?

This is an open-ended question, and you should use your best judgment about how to answer it. Be sure to define what you mean by "stable" (it doesn't refer to small perturbations from a circular orbit here)! You may restrict your consideration to the case of all objects moving in the same plane, and you may restrict the initial conditions for the masses M to those cases that would produce circular orbits in the absence of m.

Your answer will be graded on completeness, consideration of all important cases, and how quantitative your answer is. You should be sure to provide an estimate of the accuracy of any number you quote. Illustrating with typical trajectories is probably good...