1. (a) Compute the ratio of the height of the tides raised on Earth by the Moon to those raised by the Sun. (4 pts)

   (b) Compute the ratio of the tidal torque on the Moon and the Sun due to the Earth. (4 pts)

   Consider the following, if the Earth-Moon distance was reduced to half its current value.

   (c) Neglecting solar tides, how many times as large as at present would the maximum tide heights on Earth be? (3 pts)

   (d) Including solar tides, how many times as large as at present would the maximum tide heights on Earth be? (4 pts)

2. (a) Show that dust released at perihelion from a body on an eccentric Keplerian orbit will escape from the Solar System if β, the ratio of radiation pressure to the solar gravity, is as follows. (4 pts)

$$\beta \geq \frac{1-e}{2}.$$

   (b) Derive an analogous expression for the stability of a dust grain released at aphelion. (3 pts)

   (c) Assume that a dust grain is heated entirely by the interstellar radiation field at UV wavelengths, and that the UV flux is 2×10^5 photons cm^{-2}s^{-1}Å^{-1}. The bandwidth of the radiation is 1000Å, and the mean photon energy is 9 eV per photon. If the grain radiates with an efficiency of 0.1%, calculate its temperature. (3 pts)