Tutorial 8

Problem 1. (K. & K. 10.9) Halley's comet is in an elliptic orbit around the sun. The eccentricity of the orbit is 0.967 and the period is 76 years. The mass of the sun is 2×10^{30} kg and $G = 6.67 \times 10^{-11}$ N·m^2/kg^2.

1. Using these data, determine the distance of Halley's comet from the sun at perihelion (r_-) and at aphelion (r_+).

2. What is the speed of Halley's comet when it is closest to the sun?

Problem 2. (K. & K. 10.12) A space vehicle is in a circular orbit about

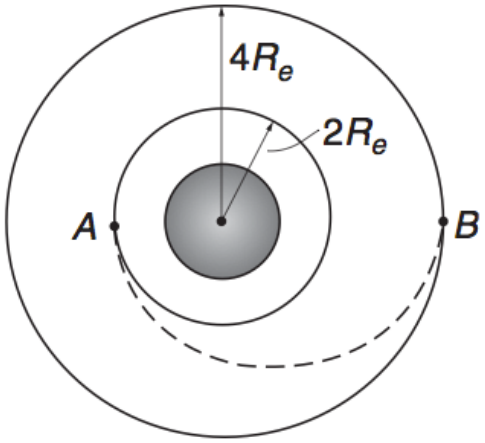

Figure 1:

the earth. The mass of the vehicle is 3000 kg and the radius of the orbit is $2R_e = 12.8 \times 10^3$ km. It is desired to transfer the vehicle to a circular orbit of radius $4R_e$.

1. What is the minimum energy expenditure required for the transfer?

2. An efficient way to accomplish the transfer is to use a semi-elliptical orbit (known as Hohmann transfer orbit), as shown. What velocity changes are required at the points of intersection A and B?