PHYS 211 Homework Assignment

Chapter 13

Problem 1 You want to position a space probe between the Earth and the Sun (on the line connecting the two). What is the distance from Earth where the magnitude of the force on the probe from Earth and the Sun is balanced?

Problem 2 A projectile is shot directly away from Earth's surface. Neglecting Earth's rotation, what is the distance d that the projectile reaches when

(a) its initial speed is half the escape speed;

(b) its initial kinetic energy is half the escape energy.

(write your answer in terms of the radius of the Earth, e.g. $d = 3.75 r_E$)

Problem 3 A satellite orbits a planet of unknown mass in a circle of radius 2.0×10^7 m. The magnitude of the gravitational force on the satellite from the planet is $F = 80$ N.

(a) What is the kinetic energy of the satellite?

(b) What would F be if the orbit was increased to 3.0×10^7 m?

Problem 4 A very massive neutron star can rotate as quickly as 1 rev/s. If the radius of such a star is only 25 km, how massive must it be to hold the surface neutrons from flying off? (remember, when something spins, there has to be some force holding it in circular motion!)

Problem 5 Two objects of mass $m_A = 50$ kg and $m_B = 100$ kg are placed a distance of 2 m apart in the vacuum of space. Object A is held in place while object B is released.

(a) What is the initial potential energy of this configuration?

(b) How much kinetic energy does object B have after it has moved 0.5 m?

(c) When they collide, how much kinetic energy does object B have? (note: this is a tricky question)