Physics 215 Fall 2019
Problem set for week 15
Optional – will not be graded, but does contain the sort of problems you are responsible for on the final exam

OpenStax:
Unit 1, Ch 13: 15, 20, 32, 40, 46, 64
Unit 2, Ch 15: 21, 27, 30

20 years in the future, you are the head engineer for a project to put a satellite into orbit around an asteroid in the asteroid belt between Earth and Mars. The asteroid is spherical with a mass of 1.1 x 10^16 kg and a radius of 8.75 km.

a) The satellite is launched from an outpost on Mars. It has a mass of 200 kg. What is its weight in Newtons on the surface of Mars?

b) Write an expression for the total energy of the satellite as it is just leaving the surface of Mars with a speed v. Do not use the flat planet approximation.

c) Use the expression in part b) to derive a formula for the escape speed from Mars. What is the escape speed from Mars?

d) Once the satellite reaches the asteroid, what must its speed be if it is orbiting 5.40km above the surface?

e) What is the escape speed from the asteroid?