Ch 4 supplemental review: Name:

This review is designed to augment the practice test and provincial exam review book assignments for chapter 4 (circular motion). It is now sufficient to do solely this assignment in test preparation.

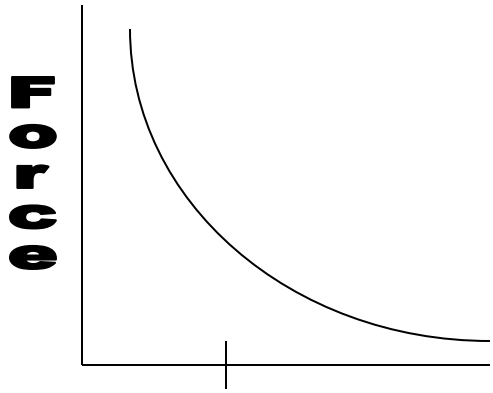
1) How much work is done on a 1000 kg satellite when moving from an altitude of 1200 km to 1000 km above the surface.

2) Using the satellite in #1 above calculate its velocity in both orbits. State what happens to velocity as orbital radius decreases. Explain why this is using the term gravitational field strength.

3) Determine the gravitational field strength of Saturn if its radius is 5.82×10^{7} m and mass is 5.68×10^{26} kg. Re-calculate this at twice the radius of Saturn.

4) What is the gravitational potential energy of the earth as it goes around the sun. Also determine the earth's kinetic energy, and its total energy.

5) Use the graph below to describe the relation between Fg and R. Shade in the region which illustrates the work done moving from the planet's surface to a radius R.



6) What work is required to move a 200 kg spacecraft from the surface of the earth to a point where g is one quarter of its surface value?

Answers:
1) -1.42×10^{9} J 2) V1000 = 7350 m/s V1200 = 7250 m/s Velocity decreases as R increases. This is because the gravitational field decreases with R^2 and therefore there is less Fg acting on the satellite. This then requires less velocity for the satellite to maintain circular motion.
3) 11.2 N/kg, 2.80 N/kg 4) Ep = -5.3×10^{33} J,Ek = 2.65×10^{33} J Etotal = -2.65×10^{33}J
5) Relation is inverse square from shape of curve, shade from Rp to some value of R
6) 6.28×10^{9} J