PHYS 1211 *University Physics I*

Winter Quarter, 2007

Problem Set 7

Due: Thurs, Feb. 22, 2007

Instructor

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M&F 11am-12pm
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(or by appointment)

Halliday, Resnick, and Walker (HRW)

Re-read Chapter 7?

Complete the following **PROBLEMS** from HRW Chapter 7: 18, 29, 34 (each is worth 10 points)

ALSO

Read Chapter 8.

Complete the following **PROBLEMS** from HRW Chapter 8: 6, 9, 31, 110, 125 (each is worth 10 points)

The work life of comets...

Several times in class I have envoked Newton's law of gravitation, which states that the magnitude of the gravitational force on an object with mass m_c exerted by a second object with mass M_s is given by:

$$F = \frac{G m_c M_s}{r^2},$$

where $G = 6.67 \times 10^{-11}$ N m^2/kg^2. The direction the force acts is always along the line between the two objects (if you set the origin of a spherical coordinate system at the center of one mass, the direction is radial ($\hat{r}$) and pointing at the second object.

Consider a comet with mass $m_c = 8.00 \times 10^{13}$ kg that is initally at rest at a distance 100 astronomical units (abbreviated a.u., the mean distance between the earth and the sun) from the sun. The sun's mass is $M_s = 1.99 \times 10^{30}$ kg. If the force of gravity causes the comet to eventually "fall" toward the sun, eventually the comet and sun will collide. Answer the following for 20 points.

1. How much work does gravity do on the comet to cause the collison?
2. If we assume mechanical energy is conserved, what is the velocity of the comet when it hits the sun?
3. What is the comet's initial potential energy?