(Due Friday, Oct. 16)

Problems

Solve the following problems from Goldstein, 3rd Ed.

- (3.10) A planet of mass *M* is in an orbit of eccentricity $\epsilon = 1 - \alpha$ where $\alpha \ll 1$, about the Sun. Assume the motion of the Sun can be neglected and that only gravitational forces act. When the planet is at its greatest distance form the Sun, it is struck by a comet of mass *m*, where $m \ll M$ traveling in a tangential direction.
  - Assuming the collision is completely inelastic, find the minimum kinetic energy the comet must have to change the new orbit to a parabola.
- (3.11) Two particles move about each other in circular orbits under the influence of gravitational forces, with a period τ. Their motion is suddenly stopped at a given instant of time, and they are then released and allowed to fall into each other.
  - Prove that they collide after time $\frac{\tau}{4\sqrt{2}}$.
- (3.14) Consider an attractive *1/r* potential when answering the following questions.
  - For circular and parabolic orbits having the same angular momentum, show that the perihelion distance of the parabola is one-half the radius of the circle.
  - Prove that the speed of a particle at any point in a parabolic orbit is $\sqrt{2}$ times the speed in a circular orbit passing through the same point.