

Problem Set 4 – due October 6

1. A meteor with kinetic energy $\frac{1}{2}mv^2$ and impact parameter b approaches a planet of mass M and radius R . (a) What is the condition that the meteor hits the planet ? (b) If the meteor just misses, what is its angle of deflection ? (10 points)
2. Goldstein *et al*, Problem 32, Chapter 3, page 132. (15 points)
3. (a) Show that an arbitrary two-dimensional, planar motion of a rigid body [*i.e.*, $x \rightarrow x'(x, y)$, $y \rightarrow y'(x, y)$, $z \rightarrow z$] can be performed by a single rotation about an axis perpendicular to the plane but not necessarily going through the body.
(b) Prove Chasles' Theorem, that any displacement of a rigid body in three dimensions is equivalent to a screw rotation - a rotation about an axis accompanied by a translation parallel to that axis.
Hint: In both cases, start from the fact the the motion is the sum of a translation and a rotation about an axis through a point in the body.
(15 points)