Physics 362 - HOMEWORK SET #3
Due February 8, 2005

1. A right circular cone of mass $M$, height $h$ and base radius $R$ rotates about an axis (labeled “O”) that goes through the tip of the cone and that is perpendicular to the symmetry axis of the cone (see diagram). Find the radius of gyration of the cone about axis O.

![Diagram of a cone with labeled dimensions](image1)

Problem 1

2. A wire of mass $M$ is bent into the shape of a semicircle of radius $R$ and lies in the $x$-$y$ plane such that the $y$ axis bisects it and the ends lie on the $x$ axis (see diagram). Find the position of the center of mass of the wire. Then, without doing any integrals, find the moment of inertia of the wire about axes that are parallel to the $x$, $y$ and $z$ axes and that go through the center of mass. [Hint: use your knowledge of the moment of inertia of a full circular ring, plus the parallel and perpendicular axis theorems.]

![Diagram of a semicircle wire](image2)

Problem 2

3. For the following two cases, determine if there is a resultant force, or if the system can be represented by a couple. If there is a resultant, find the magnitude, direction and line of action of the resultant; at what point must the resultant act if the point of action is as close as possible to the center of mass? If the system can be represented by a couple, choose one possible couple (i.e., two forces and where they act) that would give the same result. Note: in (b), the lower right force acts at a 45° angle to the horizontal.

![Diagram of a square with forces](image3)

Problem 3a

![Diagram of a L-shape with forces](image4)

Problem 3b