CMSC 23700	**Introduction to Computer Graphics**	**Homework 2**
Autumn 2015		**Due October 22**

1. Consider a cylinder with radius 1 and height 2 that is centered at the origin with its axis being the Z axis.
   (a) Give an *implicit* representation of the cylinder.
   (b) Given a sphere $\langle \mathbf{c}, r \rangle$, give pseudo code to determine if the sphere intersects the cylinder. Explain your answer.
2. An *oriented bounding box* (OBB) can be represented by a center point $\mathbf{p}$, a 3x3 rotation matrix $\mathbf{R}$ (the columns of this matrix define the axes of the OBB), and a vector $\mathbf{s}$ of extents (the distances from the center to the sides along each of the OBB's axes).
   (a) Define an affine transformation that takes the axis-aligned $2 \times 2 \times 2$ cube centered at the origin to the OBB.
   (b) Given a **ray** $R(t) = \mathbf{o} + t\mathbf{d}$, with $\|\mathbf{d}\| = 1$ and $0 \leq t$, give pseudo code for an intersection test for the ray and OBB.
3. Assume that we are approximating the circle defined by $x^2 + y^2 - r^2 = 0$ and $z = d$ (in eye space) by a regular hexagon that is inscribed in the circle (*i.e.*, the vertices of the hexagon lie on the circle). If the focal length is e, what is the maximum error in the radius of the approximation in projection-space coordinates.