Math 121 Assignment 5

Due Friday February 12

1. Find the volume of the solid obtained by rotating a circular disk about one of its tangent lines.

2. Find the volume of the solid generated by rotating the finite region in the first quadrant bounded by the coordinate axes and the curve $x^{2/3} + y^{2/3} = 4$ about either of the coordinate axes.

3. A solid has the following property. Its base is a horizontal plane and the volume of the solid lying below any horizontal plane at height z above its base is z^3. Find the cross-sectional area of the solid at height z above the base.

4. A solid has a circular base of radius r. Find the volume of the solid if all sections of the solid perpendicular to a particular diameter are
   (a) squares
   (b) equilateral triangles.

5. Find the lengths of the given curves:
   (a) $y = x^2$ from $x = 0$ to $x = 2$.
   (b) $y = \ln((e^x - 1)/(e^x + 1))$ from $x = 2$ to $x = 4$.

6. Find the area of the infinite horn generated by rotating the curve $y = \ln x$, $0 < x \leq 1$ about the y-axis.

7. Find the mass and centre of mass for
   (a) a plate occupying the region $0 \leq y \leq 4 - x^2$ if the areal density at (x, y) is ky,
   (b) a solid ball of radius R meters if the density at P is z kg/m^3, where z is the distance from P to a plane at distance $2R$ meters from the centre of the ball,
   (c) a right-circular cone of base radius a cm and height b cm if the density at point P is kz g/cm^3, where z is the distance of P from the base of the cone.