MATH 265
FALL 2008
EXAM 3

1. (5 pt) Show that the moment of inertia (about a central axis) is equal to

$$I = \frac{2}{5}MR^2$$

where M is the mass of the sphere and R is its radius.

2. (5 pt) Find the volume of the ellipsoid

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$$

where $a, b, c > 0$. Hint: it might be good to consider the elliptical coordinates $x = \rho a \sin(\phi)\cos(\theta), y = \rho b \sin(\phi)\sin(\theta), z = \rho c \cos(\phi)$.

3. (5 pt) Find the volume of the region enclosed by the paraboloid $z = x^2 + 3y^2$ and the planes $x = 0, y = 1, y = x, z = 0$.

4. (5 pt) Evaluate

$$\int\int\int_E x dV$$

where E is enclosed by the planes $z = 0$ and $z = x + y + 5$ and by the cylinders $x^2 + y^2 = 4$ and $x^2 + y^2 = 9$.

5. (5 pt) Evaluate

$$\int\int_R (\frac{x - 2y}{3x - y}) dA$$

where R is the parallelogram bounded by $x - 2y = 0, x - 2y = 4, 3x - y = 1, 3x - y = 8$.