Name: ID:

Q1. Find the average value of $f(x, y, z) = 30xz\sqrt{x^2 + y}$ over the rectangular solid in the first octant bounded by the coordinate planes and the planes $x = 1, y = 3, z = 1$.

Q2 Find the volume, in the first octant, of the solid inside both the hemisphere $z = \sqrt{16 - x^2 - y^2}$ and the cylinder $x^2 + y^2 - 4x = 0$.

Q3 Convert

$$\int_0^{2\pi} \int_0^{\sqrt{2}} \int_r^{\sqrt{4-r^2}} 3 \, dz \, r \, dr \, d\theta$$

(a) To rectangular coordinates with the order of integration dz dx dy
(b) To spherical coordinates
(c) Evaluate one of the integrals

Q4 Find the volume of the region that lies inside the sphere $x^2 + y^2 + z^2 = 2$ and *outside* the cylinder $x^2 + y^2 = 1$.