

Math 21C
Kouba
Discussion Sheet 6

1.) Let R be the solid region bounded by the surfaces $z = \sqrt{4 - x^2 - y^2}$ and $z = 0$. SET UP BUT DO NOT EVALUATE triple integrals which represent the volume of the solid

- using rectangular coordinates.
- using cylindrical coordinates.
- using spherical coordinates.

2.) Let R be the solid region bounded by the surfaces $z = \sqrt{x^2 + y^2}$ and $z = \sqrt{18 - x^2 - y^2}$. SET UP BUT DO NOT EVALUATE triple integrals which represent the volume of the solid

- using rectangular coordinates.
- using cylindrical coordinates.
- using spherical coordinates.

3.) Let R be the solid region inside the surface $x^2 + y^2 = 4$ and bounded by the surfaces $z = 0$ and $z = \sqrt{9 - x^2 - y^2}$. SET UP BUT DO NOT EVALUATE triple integrals which represent the volume of the solid

- using rectangular coordinates.
- using cylindrical coordinates.
- using spherical coordinates.

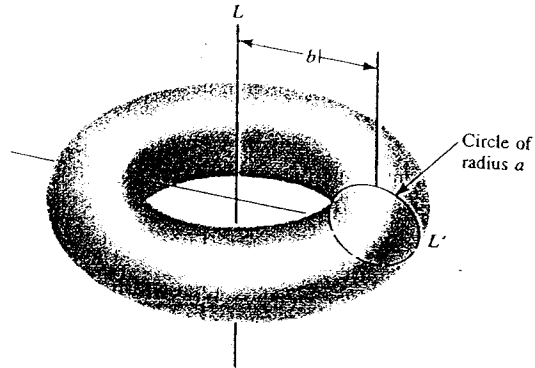
4.) Consider the UFO bounded by the surfaces $z = x^2 + y^2$ and $z = 8 - x^2 - y^2$. The density of the UFO at point $P = (x, y, z)$ is given by the square of the distance from P to the z -axis. SET UP BUT DO NOT EVALUATE triple integrals in all three coordinate systems which represent the UFO's

- average density.
- total mass.
- total volume.
- z -coordinate of the centroid.
- z -coordinate of the center of mass.
- moment of inertia about
 - the origin.
 - the z -axis.
 - the plane $z = -1$.

5.) Convert the following integral to rectangular coordinates. DO NOT EVALUATE THE INTEGRAL.

$$\int_0^{\pi/2} \int_0^{\pi/4} \int_0^{\cos \phi} \rho^3 \sin \theta \sin^2 \phi \, d\rho \, d\phi \, d\theta$$

6.) SET UP BUT DO NOT EVALUATE a triple integral which represents the volume of the given doughnut (torus).



7.) Consider the solid region R bounded by the surfaces $z = x^2 + y^2$ and $z = 2y$. Describe R using spherical coordinates.

THE FOLLOWING PROBLEM IS FOR RECREATIONAL PURPOSES ONLY.

8.) The camp cook wants to measure exactly four ounces of vinegar out of a jug, but has only a five-ounce container and a three-ounce container. How can the cook accomplish the task ?