

Math 210 (Lesieutre)

13.5: Triple integrals in cylindrical coordinates

March 14, 2017

Problem 1. a) Find the cylindrical coordinates for the point $(x, y, z) = (0, 1, 1)$.

b) Find the rectangular coordinates for the point $(1, \pi/4, 3)$.

c) Sketch the cylindrical surface defined by $z = 2r$.

Problem 2. Use a triple integral in cylindrical coordinates to compute the volume of a cylinder with radius R and height h .

Problem 3. You want to integrate the function $x^2 + y^2 + z^2$ over a cone with base a circle of radius 3 in the xy -plane centered at the origin, and vertex at the rectangular point $(0, 0, 6)$. Set up the corresponding integral in cylindrical coordinates.

Problem 4. Find the volume of the solid bounded by the paraboloid $z = 4 - x^2 - y^2$ and the xy -plane.

Problem 5. Consider the integral

$$\int_0^2 \int_0^{\pi/4} \int_0^3 r^3 z \, dz \, d\theta \, dr.$$

a) Sketch the region of integration.

b) Convert this to an integral in rectangular coordinates.