

Lecture 10 - Triple integrals in cylindrical and spherical coordinates - 7/25/2014 — Interphase 2014 Calc 3

27. Triple integrals in cylindrical coordinates

a. A 3d point can be written in cylindrical coordinates (r, θ, z) , where $x = r \cos \theta$ and $y = r \sin \theta$.

b. In cylindrical coordinates, the volume element is $dV = r dr d\theta dz$

c. To evaluate $\iiint_R f dV$ using cylindrical coordinates, specify the region in an iterated sense and write down the iterated integral with an appropriate order and with appropriate bounds of integration:

$$\int \int \int f(r, \theta, z) r dr d\theta dz.$$

28. Triple integrals in spherical coordinates

a. A 3d point can be written in spherical coordinates (ρ, φ, θ) , where

$$x = \rho \sin \varphi \cos \theta, \quad y = \rho \sin \varphi \sin \theta, \quad z = \rho \cos \varphi.$$

b. In spherical coordinates, the volume element is $dV = \rho^2 \sin \varphi d\rho d\varphi d\theta$.

c. To evaluate a triple integral using spherical coordinates, specify the region in an iterated sense and write down the iterated integral with an appropriate order and with appropriate bounds of integration:

$$\int \int \int f(\rho, \varphi, \theta) \rho^2 \sin \varphi d\rho d\varphi d\theta.$$