

15.5-8: Surface Area, Triple Integrals

Friday, April 8

Surface Area

Using the formula $A(S) = \iint_D \sqrt{1 + f_x^2 + f_y^2} dA$, find the surface area of a sphere of radius a . (Hint: after finding f_x and f_y , convert to polar coordinates)

Triple Integrals

Sketch the region E bounded by the surfaces $y = x^2$, $z = 0$, $y + 2z = 4$. Express the integral $\iiint_E f(x, y, z) dV$ as an iterated integral in the order of your choice, and find the volume of the region.

Cylindrical Coordinates

Find the volume of a cylinder using cylindrical coordinates. Set up the integral at least three different ways, and give a geometric interpretation of each ordering. Make lots of sketches.

Spherical Coordinates

Explain, with pictures, why $dV = \rho^2 \sin \phi \, d\rho \, d\theta \, d\phi$.

Why is longitude measured from $180^\circ E$ to $180^\circ W$ but latitude measured only from $90^\circ N$ to $90^\circ S$?

Find the volume of a sphere using spherical coordinates. Set up the integral at least three different ways and give a geometric interpretation of each ordering. Make lots of sketches.