Math 11, Fall 2007

Lecture 19

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Outline

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Triple integrals

- Triple integrals allow us to integrate over solid regions in $\mathbb{R}^3$
- Fubini's theorem and the theory of iterated integrals still apply.
- Cylindrical and Spherical coordinates

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Examples

- $$\iiint_E 2x \, dV$$

  where
  $E = \{(x, y, z) | 0 \leq y \leq 2, 0 \leq x \leq \sqrt{4 - y^2}, 0 \leq z \leq y\}$
- Find the volume of the solid enclosed by the paraboloid $x = y^2 + z^2$ and the plane $x = 16$.
- Evaluate

$$\int_{-2}^{2} \int_{0}^{\sqrt{4-y^2}} \int_{-\sqrt{4-x^2-y^2}}^{\sqrt{4-x^2-y^2}} \sqrt{x^2 + y^2 + z^2} \, dz dx dy$$

Examples

- Find the volume of the smaller wedge cut from a sphere of radius a by two planes that intersect along a diameter at an enagle of $\frac{\pi}{6}$.
- Find the volume of the surface given in spherical coordinates by $\rho = \sin(\phi)$. What is the shape of this surface?

Work for next class

- 17.1-17.2
- f07hw20