

Math 11, Multivariable Calculus

Written Homework 7

1. (Ch 15.4: 22). Use polar coordinates to find the volume of the solid inside the sphere $x^2 + y^2 + z^2 = 16$ and outside the cylinder $x^2 + y^2 = 4$.
2. (Ch 15.8: 24). Find the volume of the solid that lies between the paraboloid $z = x^2 + y^2$ and the sphere $x^2 + y^2 + z^2 = 2$.
3. (Ch 15.8, #28) Find the mass of a ball B given by $x^2 + y^2 + z^2 \leq a^2$ if the density at any point is proportional to its distance from the z -axis.
Hint: even though both cylindrical and spherical coordinates work for this problem, spherical coordinates give a simpler integral.
4. (Ch 15.9, #28) Find the average distance from a point in a ball of radius a to its center.
5. (Ch 15.10, #18) Evaluate $\iint_R (x^2 - xy + y^2) dA$, where R is the region bounded by the ellipse $x^2 - xy + y^2 = 2$. Use the change of variables $x = \sqrt{2}u - \sqrt{2/3}v$, $y = \sqrt{2}u + \sqrt{2/3}v$.
6. (Ch 15.10, #19) Use the transformation $x = u/v$, $y = v$ to evaluate the integral $\iint_R xy dA$, where R is the region in the first quadrant bounded by the lines $y = x$ and $y = 3x$ and the hyperbolas $xy = 1$, $xy = 3$.