University of Delaware
Department of Mathematical Sciences

MATH-243 – Analytical Geometry and Calculus C
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Spring 2013

Homework 9

Due date: April 15, 2013

Problems

Based on Sections 15.4, 15.7–15.9 of the book *Calculus: Early Transcendentals* 7th edition by J. Stewart.

1. Using polar coordinates, evaluate $\iint_D e^{-(x^2+y^2)}\,dA$, where D is the region bounded by the semicircle $x = \sqrt{4-y^2}$ and the y-axis.
2. Using polar coordinates, evaluate $\int_{-2}^{2}\int_{0}^{\sqrt{4-x^2}} \sin(x^2+y^2)\,dy\,dx$.
3. Evaluate the triple integral $\iiint_E \frac{y}{x^2+y^2}\,dV$, where $E = \{(x,y,z)\,|\,1 \le z \le 4, z \le y \le 4, 0 \le x \le y\}$.
4. Evaluate the triple integral $\iiint_E xy\,dV$, where E is bounded by the parabolic cylinders $y = x^2$ and $x = y^2$ and the planes $z = 0$ and $z = x + y$.
5. Express the integral $\iiint_E f(x,y,z)\,dV$ as an interated integral in six different ways, where E is the solid bounded by $y = 4 - x^2 - 4z^2$, $y = 0$.
6. Find the region of integration E over which $\iiint_E (1 - x^2 - 2y^2 - 3z^2)\,dV$ is a maximum.
7. Using cylindrical coordinates, sketch the region described by $0 \le \theta \le \pi/2$, $r \le z \le 2$.
8. Using cylindrical coordinates, sketch the region of integration of $\int_{-\pi/2}^{\pi/2}\int_{0}^{2}\int_{0}^{r^2} r\,dz\,dr\,d\theta$.
9. Using spherical coordinates, sketch the region described by $2 \le \rho \le 4$, $0 \le \phi \le \pi/3$, $0 \le \theta \le \pi$.

10. Write inequalities in spherical coordinates to represent the solid above the cone $z = \sqrt{x^2 + y^2}$ and below the sphere $x^2 + y^2 + z^2 = z$.