University of Delaware
Department of Mathematical Sciences

MATH-243 – Analytical Geometry and Calculus C
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Fall 2012

Homework 9

Due date: November 12, 2012

Problems

Based on Sections 14.7 – 15.3 of the book *Calculus: Early Transcendentals* 7th edition by J. Stewart.

1. Find the absolute maximum and minimum values of $f(x, y) = 4xy^2 - x^2y^2 - xy^3$ on the closed triangular region in the xy-plane with vertices (0,0), (0,6), and (6,0).
2. A rectangle with length L and width W is cut into four smaller rectangles by two lines parallel to the sides. Find the maximum and minimum values of the sum of the squares of the areas of the smaller rectangles.
3. Find the points on the surface $xy^2z^3 = 2$ that are closest to the origin.
4. Use 9 (i.e, an array of 3×3) rectangular prisms to approximate the volume of the solid region between $f(x, y) = \cos(x)\sin(y)$ and the rectangular region R in the xy-plane given by $-2 \leq x \leq 2$ and $-2 \leq x \leq 2$. Use the midpoint of each patch to compute the height of each prism.
5. Use a double integral to find the exact volume of the solid region described in the previous exercise. Use CalcPlot3D (the applet we used in class) to create a graph of the region in the xy-plane along with the rectangular prisms you used and the surface above the region. Attach a printout.
6. Calculate the iterated integral $\displaystyle\int_0^2 \int_0^{\pi/2} x \sin y \, dy \, dx$.
7. Calculate the iterated integral $\displaystyle\int_0^1 \int_0^3 e^{x+3y} \, dx \, dy$.
8. Evaluate the double integral $\displaystyle\iint_D y^2 \, dA$, where $D = \{(x, y) \mid -1 \leq y \leq 1, -y - 2 \leq x \leq y\}$.

9. Evaluate the double integral $\iint_D x^3\,dA$, where $D = \{(x, y) \mid 1 \leq x \leq e,\ 0 \leq y \leq \ln x\}$.

10. Evaluate the double integral $\iint_D (x + y)\,dA$, where D is bounded by $y = \sqrt{x}$ and $y = x^2$.