

Fifth Examination
Tuesday, April 22, 2008

Instructions: This exam should be done on your own paper. Your name should be on each sheet and on the back of the last sheet; the answers should appear written carefully and in order. If in doubt, show intermediate steps: Full credit may not be given, even for correct answers, unless work is arranged clearly and explained. This exam is closed book. You may leave after handing in your exam paper, but be sure to check your answers carefully. You may keep this copy of the exam questions. Each entire problem is worth 25 points.

1. Compute

$$\iint_{\mathcal{R}} e^{x+y} dA,$$

where \mathcal{R} is the square defined by $0 \leq x \leq 1$ and $0 \leq y \leq 1$.

2. Compute the average value of $f(x, y) = x^2 + y^2$ over the unit disk $\{(x, y) \mid x^2 + y^2 \leq 1\}$.

3. Compute

$$\int_{x=0}^3 \int_{y=-\sqrt{9-x^2}}^{\sqrt{9-x^2}} \int_{z=-\sqrt{9-x^2-y^2}}^{\sqrt{9-x^2-y^2}} x dz dy dx$$

by first converting the multiple integral into spherical coordinates. Also, draw the region of integration, and describe the region in words.

4. Find the volume of the region under the graph of $f(x, y) = xy$ and above the triangle $0 \leq x \leq 2$, $0 \leq y \leq x$ in the xy -plane.