FALL 2007 — MA 227-6B — TEST 3
NOVEMBER 19, 2007

Name: ______________________________

1. Part I

There are 6 problems in Part 1, each worth 4 points. Place your answer on the line to the right of the question. Only your answer on the answer line will be graded.

(1) Evaluate $\int_{-1}^{1}\int_{0}^{3} 2xy\,dy\,dx$.

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(2) Integrate the function $f(x, y) = x^2y$ over the rectangle $[0, 3] \times [2, 4]$.

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(3) Express $\iint_D f(x, y)\,dA$ as an iterated integral, where D is the region bounded by the lines $x = 0$ and $y = 0$ and $y = 4 - x$.

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(4) Q is the portion of the disk of radius 2 centered at zero which lies in the first quadrant. Express Q in terms of polar coordinates.

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(5) Find rectangular coordinates of the point with cylindrical coordinates $r = 3$, $\theta = \pi/4$, and $z = 5$.

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(6) Compute the Jacobian of the transformation $x = u - 3v$, $y = 2u - 3v$.

2. Part II

There are 3 problems in Part 2, each worth 12 points. On Part 2 problems partial credit is awarded where appropriate. Your solution must include enough detail to justify any conclusions you reach in answering the question.

(1) Let D be the bounded domain which is enclosed by the curves $y = 2x$ and $y = x^2 - 3$.
  (a) Sketch the domain.
  (b) Describe the domain with inequalities.
  (c) Explain carefully the process by which the double integral $\iint_D f(x, y)\, dA$ is turned into an iterated integral.

(2) Evaluate the triple integral $\iiint_E z^2\, dV$, where E is that portion of the ball of radius 3 centered at zero for which $y \geq 0$.

(3) The ellipse E defined $4x^2 + 9y^2 \leq 36$ can be transformed into a circle by a change of variables. Perform such a change of variables to find the area of the ellipse.