

SPRING 2006 — MA 227-6D — TEST 4

Name: \_\_\_\_\_

1. PART I

There are 4 problems in Part I, each worth 4 points. Place your answer on the line below the question. In Part I, there is no need to show your work, since only your answer on the answer line will be graded.

- (1) Find the Jacobian of the transformation  $x = 2u^2 - 6v^2$ ,  $y = 4u^2 + 5v^2$ .

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- (2) Find the gradient vector field of  $f(x, y) = \ln(2x + 3y)$ .

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- (3) Compute  $\operatorname{div} \mathbf{F}$  when  $\mathbf{F}(x, y, z) = \langle 0, 2 \cos(xz), -2 \sin(xy) \rangle$ .

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- (4) Compute  $\operatorname{curl} \mathbf{F}$  when  $\mathbf{F}(x, y, z) = \langle 8y^2z, 0, -6xyz \rangle$ .

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## 2. PART II

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

- (1) Evaluate the integral  $\iint_E y^2 dA$  where  $E$  is the region bounded by the ellipse  $x^2/4 + y^2/9 = 1$  by transforming the domain of integration to a circle.

- (2) Let  $C$  be the curve consisting of the sides of the triangle with vertices  $(0, 0)$ ,  $(3, 0)$ , and  $(0, 3)$ . Evaluate  $\int_C (y^2 dx + 3xy dy)$  by two methods: directly and using Green's Theorem.