

Mathematics 16B
Sarason

September 28, 2005

MIDTERM EXAMINATION 1

Name (Printed): _____

Signature: _____

SID Number: _____

GSI (check one): Matthew Gagliardi
 Jon Harel
 James Kelley

1	
2	
3	
4	
TOTAL	
GRADE	
POINTS	

Section Number or Time: _____

Put your name on every page.

Closed book except for crib sheet. No calculators.

SHOW YOUR WORK. Cross out anything you have written that you do not wish the grader to consider.

The points for each problem are in parentheses. Perfect score = 65.

Name _____

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1. (15) In the manufacture of Cuddly-Wuddly Dolls, the number of dolls produced with the utilization of x units of labor and y units of capital is given by the production function $f(x, y) = 200\sqrt{6x^2 + y^2}$. Determine the marginal productivities of labor and capital when $x = 4$ and $y = 2$.

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2. (10) Evaluate the integral $I = \iint_R (x^2 + y^2) dx dy$, where R is the triangle with vertices $(0, 0)$, $(1, 0)$, $(0, 1)$. (The region R is bounded below by the x -axis, on the left by the y -axis, and above by the line $x + y = 1$.)

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3. (20) For the function $f(x, y) = 16x^5 + 5y^2 - 10xy$:
- (a) Find the critical points.
 - (b) Use the second-derivative test to determine the nature of each critical point.

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4. (20) The Longwhorm Apple Orchards expects to harvest 50,000 bushels of apples next season. The number of bushels that can be harvested with the utilization of x units of labor and y units of capital is given by the production function $f(x, y) = 1000x^{4/5}y^{1/5}$. If each unit of labor costs the company \$1000 and each unit of capital costs \$10,000, what is the ratio of labor expenses to capital expenses that minimizes the harvesting cost? (You are not being asked to find the cost-minimizing labor expenses and capital expenses, only their ratio.)