

MATH 202 — MIDTERM II

DEPARTMENT OF MATHEMATICS
Johns Hopkins University

April 6, 2005

NAME: _____

SIGNATURE: _____

SECTION NUMBER: _____

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1. This exam has 5 pages including this cover.
2. No books, notes or calculators are allowed.
3. The correct answer without appropriate justification is worth **zero** points. For full credit we must be able to see how you got your answer.

PROBLEM	POINTS	SCORE
1	25	
2	25	
3	25	
4	25	
TOTAL	100	

Problem 1. [25 pts]

Find and classify the critical points of

$$f(x, y) = x^3 - 4x^2 - xy - y^2$$

(on the whole (x, y) -plane).

Problem 2. [25 pts]

Find the maximum and minimum of the function

$$h(x, y) = x^3 - y^2 + 1$$

subject to the constraint $x^2 + y^2 \leq 1$.

Problem 3. [25 pts]

Compute the integral

$$\int \int_D x \sin(y^3) dx dy$$

where D is the region in \mathbb{R}^2 bounded by the lines $x = 0$, $y = 1$, and $y = x/2$.

Problem 4. [25 pts]

Let V be the solid region bounded by the paraboloid $z = x^2 + y^2 + 1$, the xy -plane and the vertical cylinder $x^2 + y^2 = 1$.

- a. [10 pts] Write an expression for the volume of V as a double integral over an explicit region in \mathbb{R}^2 .
- b. [15 pts] Calculate the volume of V . [Hint: use polar coordinates.]