

Simon Fraser University
MATH 251 - Summer 2005

Midterm 2
June 29, 2005, 8:30 – 9:20 am

Last Name (please print):	_____
First Name (please print):	_____
Student Number:	_____
Signature:	_____

Instructions:

1. DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO.
2. Fill in the above box.
3. This exam contains 8 pages with a total of 6 questions. Once the exam begins please check to make sure your exam booklet is complete.
4. Only complete well-organized solution will receive full credit
5. If you run out of space in a problem, use the space on the back of the previous page and clearly indicate where the solution continues.
6. Only scientific calculators are allowed.
7. No book, paper, or device, other than the usual writing instruments, this booklet and a scientific calculator, shall be within reach of a student during the examination.
8. During the examination, speaking to, communicating with, or deliberately

exposing written papers to the view of other examinees is forbidden.

Question	Marks
1	/5
2	/5
3	/10
4	/5
5	/5
6	/10
Total	/40

1. Locate and classify the critical points of the function

$$f(x, y) = x^2 + xy + y^2 - 6x + 2.$$

[5 marks]

2. Show that $\lim_{(x,y) \rightarrow (0,0)} \frac{\sin y}{x}$ does not exist.

[5 marks]

3. Given the function $f(x, y) = \frac{1}{2} \ln(x^2 + y^2)$.

a) Find the differential df .

[5 marks]

b) Find the direction \vec{u} in which the function f decreases most rapidly at the point $P(3, 4)$.

[5 marks]

4. Suppose that $w = f(x, y)$ has continuous second partial derivatives, where

$x = t + s$ and $y = t - s$. Compute $\frac{\partial^2 w}{\partial t \partial s}$ in terms of $\frac{\partial^2 w}{\partial x^2}$ and $\frac{\partial^2 w}{\partial y^2}$. **[5 marks]**

5. Use the method of Lagrange multipliers to find the shortest distance from the origin $(0,0,0)$ to the plane $x + 2y + 2z = 1$. **[5 marks]**

6.

- a) Evaluate the integral of $f(x, y) = xy$ over the region R bounded by $y = x^2$ and $y = 4$. **[5 marks]**

b) Evaluate $\int_0^1 \int_x^1 e^{-y^2} dy dx$.

[5 marks]