MIDTERM 1

May 20, 2002

Instructions.

Please show your work. You will receive little or no credit for an answer not accompanied by appropriate explanations, even if the answer is correct. If you have a question about a particular problem, please raise your hand and one of the proctors will come and talk to you.

Calculators or computers of any kind are not allowed. You are not allowed to consult any other materials of any kind, including books, notes and your neighbors. You will find a list of some useful formulas on page 2 of the exam.

At the end of the exam, please hand the exam paper to your TA. Please be prepared to show your university ID upon request.

If you have a question about the grading of a particular problem, please come and see me or one of the TAs *within 14 days of the exam*.

Name:_____ Student ID:_____

Section:_____

#1	#2	#3	#4	#5	Total

$$\cos^2 t + \sin^2 t = 1 \qquad \sin 2t = 2 \sin t \cos t$$

$$\sin^2 \frac{t}{2} = \frac{1-\cos t}{2} \qquad \cos^2 \frac{t}{2} = \frac{1+\cos t}{2}$$

$$\cos 2t = \cos^2 t - \sin^2 t \qquad \frac{\partial f}{\partial x} = \lim_{\Delta x \to 0} \frac{f(x+\Delta x, y) - f(x,y)}{\Delta x}$$

$$L = \int_a^b \| \overrightarrow{r} \| dt \qquad \frac{d}{dt} \langle f, g, h \rangle = \langle f', g', h' \rangle$$

$$\overrightarrow{v} \cdot \overrightarrow{w} = \| \overrightarrow{v} \| \| \overrightarrow{w} \| \cos \theta \qquad \| \overrightarrow{v} \times \overrightarrow{w} \| = \| \overrightarrow{v} \| \| \overrightarrow{w} \| |\sin \theta|$$

Problem 1. Let $f(x, y) = \frac{x}{y}$. (a) Determine the domain and range of f. (b) Sketch enough level lines of f to give an idea of how the level lines look like. (c) Does the limit $\lim_{(x,y)\to(0,0)} f(x, y)$ exist?

Problem 2. Evaluate the following limit, or show that the limit does not exist

$$\lim_{(x,y)\to(0,0)} \frac{\sin(x+y)}{x+y}.$$

Problem 3. A ball is thrown from the ground at the angle of $\pi/6$ with the ground at the initial velocity of $10m/s$. The acceleration of gravity is $g = 9.8m/s^2$. Find how long it takes before the ball hits the ground again.

Problem 4. Sketch the curves obtained as intersections of the quadratic surface $x^2 - 3y^2 - z = 0$ with the planes $z =$ const. Name and sketch the quadratic surface.

Problem 5. Let $f(x, y) = e^{-(x^2+y^2)}$. Compute the following partial derivatives of f:

$$\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial^2 f}{\partial y \partial x}.$$