Name: _____

MATH 4606: ADVANCED CALCULUS
SAMPLE MIDTERM EXAM II

INSTRUCTOR: SASHA VORONOV

You may not use a calculator, notes, books, etc. Only the exam paper and a pencil or pen may be kept on your desk during the test. You must show all work.

Good luck!

Problem 1. Give an example of a bounded, continuous function on $(0, 1)$ that is not uniformly continuous on $(0, 1)$. Explain why it is not uniformly continuous.

Problem 2. Show that the equation $\sin x = x - x^3/3! + x^5/5!$ has no solutions on $(0, \pi/2)$.

Problem 3.   (1) Consider the equation $(2x^2 + z^2 - 2)^{1/2} = \cos(yx^2)$. Assume that it defines x as a function of y and z with $x(0, 1) = -1$, compute $\frac{\partial x}{\partial z}(0, 1)$.

   (2) Consider the following equations

$$(2x^2 + z^2 - 2)^{1/2} = \cos(yx^2)$$
$$2x + y + z^2 = \sin y - z.$$

Assuming that they define x and z as a function of y with $x(0) = -1$ and $z(0) = 1$, compute $\frac{dx}{dy}$ and $\frac{dz}{dy}$ at $y = 0$.

Problem 4. Let x, y, z be positive variables and a, b, c positive constants. Find the minimum of $x + y + z$ subject to the constraint $(a/x) + (b/y) + (c/z) = 1$.

Why not check up all your work?

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Date: March 31, 2007.