

Name: _____ UT EID: _____
Present Calculus Course: _____ Instructor: _____
Permanent Mailing Address: _____

E-mail address: _____
College (Natural Sciences, Engineering, etc.) _____

Submit your solutions *with all work shown on the sheets provided*. No calculators allowed. (Suggestion: Do preliminary work on scratch paper that you don't submit; write up final solutions neatly and in order; write your name on all pages submitted.)

1. Find all lines tangent to the curve $y = x^3 + 14x^2 + 30x + 72$ which pass through the origin.

2. Find, with proof, the absolute maximum of the function

$$f(x) = \frac{1}{1 + |x - 2|} + \frac{4}{1 + |x - 5|}$$

3. Does the improper integral $\int_0^1 \frac{e^{-1/x}}{x^3} dx$ converge?

4. What is the sum of this series?

$$\sum_{n=1}^{\infty} \left(\frac{(-3)^n - n}{4^n} \right)$$

5. For this function of two variables

$$f(x, y) = \begin{cases} xy(x^2 - y^2)/(x^2 + y^2) & \text{if } (x, y) \neq (0, 0) \\ 0 & \text{if } (x, y) = (0, 0) \end{cases},$$

compute $f_{yx}(0, 0) - f_{xy}(0, 0)$ (that is, the value of $\frac{\partial^2 f}{\partial x \partial y} - \frac{\partial^2 f}{\partial y \partial x}$ at the origin.)

Answers will soon appear at <http://www.math.utexas.edu/users/rusin/Bennett/> .