

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. The equation $y^3 + x^2y + 2x^3 - 3x^2 + 1 = 0$ defines a curve in the plane. We view this curve as the graph of a function $y = f(x)$. Find all the critical points of this function and classify them as local maxima or local minima.

2. Show that $I = \int_1^2 \frac{1}{4+x^4} dx$ lies between $\frac{1}{20}$ and $\frac{7}{24}$. Five points extra credit goes to the contestant who finds the smallest such interval containing the value of I .

3. Does the following series converge? (Why or why not?)

$$\sum_{k=0}^{\infty} \left(3 \cdot \frac{\ln(4k+2)}{4k+2} - \frac{\ln(4k+3)}{4k+3} - \frac{\ln(4k+4)}{4k+4} - \frac{\ln(4k+5)}{4k+5} \right)$$

$$= 3 \cdot \frac{\ln 2}{2} - \frac{\ln 3}{3} - \frac{\ln 4}{4} - \frac{\ln 5}{5} + 3 \cdot \frac{\ln 6}{6} - \frac{\ln 7}{7} - \frac{\ln 8}{8} - \frac{\ln 9}{9} + 3 \cdot \frac{\ln 10}{10} - \dots$$

4. Compute the limit or show that the limit does not exist:

$$\lim_{(x,y) \rightarrow (0,0)} (\cos(x+y))^{\cot(x^2-xy+y^2)}$$

5. Compute

$$\int_{y=0}^1 \left(\int_{x=0}^1 \frac{x-y}{(x+y)^3} dx \right) dy \quad \text{and} \quad \int_{x=0}^1 \left(\int_{y=0}^1 \frac{x-y}{(x+y)^3} dy \right) dx$$

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