Spring 2001
May 24, 12:15–15:15

NAME: ______________________________
I.D.: ______________________________

Math 101 – Calculus I

FINAL EXAM

Terms And Conditions

1. This exam consists of 5 questions of equal weight.
2. Each question is on a separate sheet. Please read the questions carefully and write your answers under the corresponding questions. Be neat.
3. Identical solutions (especially identically wrong ones) will not get credit.
4. Show all your work. Correct answers without sufficient explanation might not get full credit.
5. Calculators are not allowed.

Guidelines

1. Indicate clearly and unambiguously your final result. In proofs, state explicitly each claim.
2. Do not misread the questions or skip parts thereof. If you did, do not complain.
3. If you believe that a problem is misstated, do not try to solve it; explain your point of view instead.
4. Each problem has a reasonably short solution. If your calculation goes out of hands, something must be wrong.

Please do not write below this line

1	2	3	4	5	Total

Problem 1. Evaluate

(a) $\displaystyle\int_{\pi^2/16}^{\pi^2/9} \frac{\tan\sqrt{x}}{2\sqrt{x}}\,dx$

(b) $\displaystyle\int \frac{x+2}{\sqrt{1-x^2}}\,dx$

Problem 2. Find the center of gravity of a uniform plate covering the region bounded by the curves $y = \pm(1 - x^2)^{-1/2}$ and the lines $x = 0$ and $x = 1$.

Problem 3. Test for absolute/conditional convergence. Explain your answer.

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}+\sqrt{n+1}}$

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}(n!)^2}{(2n)!}$

(c) $\displaystyle\sum_{n=1}^{\infty} n^2(2/3)^n$

Problem 4. A rectangular sheet of perimeter 36 cm is to be rolled into a cylinder (to form its side surface). What should the dimensions x and y of the rectangular be to give the maximal volume?

Problem 5.
(a) Find the first four terms of the Maclaurin series of the function $f(x) = \sqrt{x+4}$.

(b) Find the Maclaurin series of the function $\sinh x = \dfrac{e^x + e^{-x}}{2}$.