Math 1271 Calculus I
Spring 2015
Exam 2A
4/2/15
Time Limit: 50 Minutes

Name (Print): _____

Workshop Leader: _____

Section #: _____

This exam contains 7 pages (including this cover page) and 6 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and **put your initials** on the top of every page, in case the pages become separated.

You may *not* use your books, notes, or a graphing calculator on this exam.

You are required to show your work on each problem on this exam. The following rules apply:

- **Organize your work** in a reasonable, tidy, and coherent way. Work that is disorganized and jumbled that lacks clear reasoning will receive little or no credit.
- **Unsupported answers will not receive full credit.** An answer must be supported by calculations, explanation, and/or algebraic work to receive full credit. Partial credit may be given to well-argued incorrect answers as well.
- If you need more space, use the back of the pages. **Clearly indicate when you have done this.**
- **Give answers in exact form** ($\sqrt{2}$ not 1.414, π not 3.14159)

Problem	Points	Score
1	24	
2	17	
3	15	
4	12	
5	12	
6	20	
Total:	100	

Do not write in the table to the right.

1. (24 points) Find the limit.

(a) (8 points) $\lim_{x\to 0} \dfrac{e^x - 1 - x}{x^2}$

ANSWER_____

(b) (8 points) $\lim_{x\to 0} \dfrac{\tan x - 1}{x + 1}$

ANSWER_____

(c) (8 points) $\lim_{x\to \infty} x^{1/x}$

ANSWER_____

2. (17 points) Let $f'(x) = 2 + \cos x$.

   (a) (8 points) If $f(\pi) = \pi$, find $f(x)$.

   (b) (9 points) Find the number(s) that satisfies the conclusion of the Mean Value Theorem for the function f in (a) on the interval $[0, \pi]$.

   (*Hint* : The Mean Value Theorem claims that if f is continuous on the closed interval $[a, b]$ and differentiable on (a, b), then there is at least one point c in (a, b) such that the instantaneous rate of change at c is equal to the average rate of change over $[a, b]$.)

3. (15 points) Let $g(x) = (x-3)\sqrt{x}$.

   (a) (8 points) Find intervals of increase or decrease.

   (b) (7 points) Find the inflection points of the function.

4. (12 points) Using either a linear appoximation or differentials, estimate $\ln 1.01$.

5. (12 points) If $L^2 = x^2 + y^2, (L \geq 0)$, $\dfrac{dx}{dt} = -1$, and $\dfrac{dy}{dt} = 3$, find $\dfrac{dL}{dt}$ when $x = 5$, $y = 12$.

6. (20 points) Suppose $300\,\text{in}^2$ of material is available to make a box with a square base and an open top. Find the dimensions of the box with the greatest volume.