Math 34 | **TUFTS UNIVERSITY** | **November 3, 2014**
Calculus II | **Department of Mathematics** | **All sections**
Exam 2

No books, notes, **or calculators**. **TURN OFF YOUR CELL PHONE. ANYONE CAUGHT WITH THEIR CELL PHONE ON WILL BE GIVEN A 10 POINT DEDUCTION.** Cross out what you do not want us to grade. You **must** show work to receive full credit. Please try to write neatly. You need not simplify your answers unless asked to do so. You should evaluate standard trigonometric functions like $\tan(\pi/3)$. You are not allowed to quote results about growth rates. You are required to **sign** your exam on the last page. With your signature, you pledge that you have neither given nor received assistance on this exam. On the inside of the last page there is a blank side of paper for scratch work that is not to be graded.

Problem	Point Value	Points
1(a)	10	
1(b)	10	
2 (a)	10	
2 (b)	10	
3	12	
4	12	
5 (a)	11	
5 (b)	11	
6	14	
	100	

1. (20 points) Determine the convergence or divergence of the following series. Justify your answer. State and check hypotheses of any test, rules or theorems you use. (10 points each)

1a) $\displaystyle\sum_{k=1}^{\infty} \frac{5+\cos(k)}{\sqrt{k}}$

Determine the convergence or divergence of the following series. Justify your answer. State and check hypotheses of any test, rules or theorems you use.

1b) $\sum_{k=2}^{\infty} \frac{1}{k\sqrt{\ln k}}$

2. (20 points) Determine the convergence or divergence of the following series. Justify your answer. State and check hypotheses of any test, rules or theorems you use. *If the series converges, find its sum.* (10 points each)

2a) $\displaystyle\sum_{k=1}^{\infty} \frac{(-5)^{k+1}}{3^{2k}}$

Determine the convergence or divergence of the following series. Justify your answer. State and check hypotheses of any test, rules or theorems you use. *If the series converges, find its sum.*

2b) $\displaystyle\sum_{k=1}^{\infty}\left(\sin\left(\frac{\pi}{k+1}\right)-\sin\left(\frac{\pi}{k+2}\right)\right)$

3. (12 points) Quadratic Approximation

   (a) Find the 2nd-order Taylor polynomial $p_2(x)$ for $f(x) = \dfrac{x}{e} + \ln x$ centered at e.

   (b) Use the polynomial you found in part (a) to approximate $f(e/2)$.

4. (12 points)

(a) What is the conclusion of the Root Test for the series $\displaystyle\sum_{n=1}^{\infty}\left(\frac{n-1}{n}\right)^n$?

(b) Show that $\displaystyle\lim_{n\to\infty}\left(1-\frac{1}{n}\right)^n = e^{-1}$.

(c) Now use part b) above to help you determine the convergence or divergence of the series $\displaystyle\sum_{n=1}^{\infty}\left(\frac{n-1}{n}\right)^n$.

5. (22 points) Determine whether each of the following series converges absolutely, conditionally, or diverges. Justify your answer. State and check hypotheses of any test, rules or theorems you use. (11 points each)

   (a) $\displaystyle\sum_{k=1}^{\infty}(-1)^k \frac{k^2}{k!}$

5(b) Determine whether the following series converges absolutely, conditionally, or diverges.

$$\sum_{k=2}^{\infty} \frac{(-1)^k}{\sqrt[3]{k-1}}$$

6. (14 points) Find the radius of convergence and interval of convergence of the power series

$$\sum_{k=1}^{\infty} \frac{(x-2)^k}{k \cdot 9^k} .$$

Blank page for scratch work.

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Name _____

Circle your section:

34-01 Molly Hahn TThF 8:30-9:20

34-02 Melody Takeuchi TWF 9:30-10:20

34-03 Mary Glaser TThF 12-12:50

34-04 Molly Hahn TTh1:30-2:45

I pledge that I have neither given nor received assistance on this exam.

Signature _____