Math 31B
Integration and Infinite Series

Practice Midterm 3

Instructions: You have 50 minutes to complete this exam. There are 6 questions, worth a total of 100 points. This test is closed book and closed notes. No calculator is allowed. Please write your solutions in the space provided, show all your work legibly, and clearly reference any theorems or results that you use. Do not forget to write your name, section (if you do not know your section, please write the name of your TA), and UID in the space below. **Failure to comply with any of these instructions may have repercussions in your final grade.**

Name: _____
ID number: _____
Section: _____

Question	Points	Score
1	15	
2	17	
3	17	
4	17	
5	17	
6	17	
Total:	100	

Problem 1. *15pts.*

Determine whether the following statements are true or false. If the statement is true, write T in the box provided under the statement. If the statement is false, write F in the box provided under the statement. Do not write "true" or "false".

(a) ___ The ratio test can always be used to determine whether an infinite series converges or diverges.

(b) ___ If an infinite series converges absolutely then it must also converge.

(c) ___ A series with positive terms whose general term converges to zero is always convergent.

(d) ___ Let $f(x)$ be an infinitely differentiable function defined around a real number c. Then we can compute the Taylor series of $f(x)$ centered around c.

(e) ___ Let $F(x)$ be a power series. Then $F(x)$ has a radius of convergence.

Problem 2. *17pts.*

Determine whether the infinite series $\sum_{n=1}^{\infty} \frac{1}{2^{\ln(n)}}$ diverges or converges and, if so, evaluate it.

Problem 3. *17pts.*

Determine whether the infinite series

$$S = \frac{1}{2} - \frac{1}{2} + \frac{1}{3} - \frac{1}{3} + \frac{1}{4} - \frac{1}{4} + \frac{1}{5} - \frac{1}{5} + \cdots$$

diverges or converges and, if so, evaluate it.

Problem 4. *17pts.*

Determine whether the infinite series $\sum_{n=0}^{\infty} \left(\frac{k}{3k+1}\right)^n$ diverges or converges.

Problem 5. *17pts.*

Find the interval of convergence of the power series $\sum_{n=1}^{\infty} (-1)^n \frac{x^{2n+1}}{n2^n}$.

Problem 6. *17pts.*

(a) Find the Taylor series centered at $c = 3$ of $f(x) = \frac{1}{1-x^2}$, and find the interval of convergence of this Taylor series.

(b) Find the terms of the Taylor series centered at $c = 0$ of $f(x) = \frac{\sin(x)}{1-x}$ up to degree 4.