MATH 31B, LECTURE 1
FINAL EXAMINATION
JUNE 15, 2012

Name:_____

UID:_____

Signature: _____

TA: (circle one) Charles Marshak Theodore Gast Andrew Ruf

Discussion meets: (circle one) Tuesday Thursday

Instructions: The exam is closed-book, closed-notes. Calculators are not permitted. Answer each question in the space provided. If the question is in several parts, carefully label the answer to each part. Do all of your work on the examination paper; scratch paper is not permitted. If you continue a problem on the back of the page, please write "continued on back".d

Each problem is worth 20 points.

Problem	Score
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

Problem 1: Calculate $g(1)$ and $g'(1)$, where $g(x)$ is the inverse of $f(x) = x + \ln x$.

Problem 2: Evaluate the integral

$$\int x\sqrt{9-x^2}\,dx$$

using trigonometric substitution.

Problem 3: Evaluate the integral

$$\int \frac{x^5 + 2}{x^2(x+1)}\, dx.$$

Problem 4: Evaluate the integral

$$\int \sin(\ln x)dx.$$

Problem 5: Determine whether or not the improper integral

$$\int_1^2 \frac{1}{x \ln x}\, dx$$

converges.

Problem 6: Use the error bound for Taylor polynomials to find a value of n for which

$$|\ln 2 - T_n(2)| \leq 10^{-6},$$

where T_n is the nth Taylor polynomial for $f(x) = \ln x$ centered at 1.

Problem 7: Determine whether the series

$$\sum_{n=1}^{\infty} \frac{5^{(n^2)}}{n!}$$

converges.

Problem 8: Find the interval of convergence of the power series

$$F(x) = \sum_{n=1}^{\infty} \frac{n(2x)^{2n}}{5n+4}.$$

Problem 9: Use Taylor series to approximate the integral

$$S = \int_0^1 \cos(x^3)\, dx$$

with an error of at most 10^{-4}.

Problem 10: Find the terms through degree 7 of the Taylor series $T(x)$ centered at $c = 0$ of $f(x) = \sin(x)\cos(x)$.