Last Name:_____

Math 2B Final Exam

Sample # 1

First Name:_____

Last Name:_____

Student ID #:_____

Section:_____

I certify that this exam was taken by the person named and done without any form of assistance including books, notes, calculators and other people.

_____

Your signature

(For instructor use only!)

Problem	**Score**	**Problem**	**Score**
1		8	
2		9	
3		10	
4		11	
5		12	
6		13	
7		14	
		TOTAL	

ID #:_____

- *This exam consists of 14 questions. # 1-10 are worth 6 pts each and # 11-14 are worth 10 pts each.*
- *Read the directions for each problem carefully and answer all parts.*
- *Please **show all work** needed to arrive at your solutions.*
- *Clearly **indicate your final answer** to each problem.*

1.) Suppose that $\int_{-1}^{1} f(x)dx = 6$, $\int_{1}^{4} f(x) = -2$, and $\int_{-1}^{1} h(x)dx = 9$.
Use this information to compute the following:

a.) $\int_{4}^{1} 6f(x)dx$

b.) $\int_{-1}^{1} [2f(x) + 3h(x)]dx$

c.) $\int_{-1}^{4} f(x)dx$

2.) a.) Evaluate the following derivative

$$\frac{d}{dx}\int_{\sin x}^{x^2} t^3 \tan(t)dt$$

b.) Let $r(t)$ be the rate at which the world's oil is consumed, where t is measured in years starting at $t = 0$ starting on January 1, 2000, and $r(t)$ is measured in barrels per year. What does $\int_{0}^{13} r(t)dt$ represent and what are its units?

Evaluate each of the following integrals

3.) $\int x^2 \tan^{-1}x \ dx$

4.) $\int \frac{1}{x \ln 3x} dx$

5.) $\int \sin^5 x \cos^2 x \, dx$

6.) $\int \frac{\sqrt{x^2 - 25}}{x} dx$, *where* $x > 5$

7.) Determine whether each of the following improper integrals are convergent or divergent. Evaluate the integral if it is convergent.

$a)\ \int_0^2 \frac{1}{(x-2)^2}\,dx$

$b)\ \int_{-\infty}^{\infty} \frac{1}{1+x^2}\,dx$

8.) a.) Find the average value of the function $f(x) = \sec^2 x$ on the interval $\left[0, \frac{\pi}{4}\right]$.

b.) Find the arc length of the curve given by $y = 2x^{3/2}$ from $x = 0$ to $x = 1$.

9.) Find the first 5 non-zero terms in the Maclaurin series for $f(x) = (1-x)^{-2}$. Find the associated radius of convergence of this power series.

10.) Determine whether each of the following sequences converges or diverges. If it converges, find the limit.

$a.)$ $a_n = \left(\frac{2}{3}\right)^n + 3$

$b.)$ $b_n = n^3 e^{-n}$

$c.)$ $c_n = \arctan(\ln n)$

11.) Find the area of the region bounded by $y = \sqrt{|x|}$ and the line $5y = x + 6$.

12.) a.) The region bounded by the curve $y = x^2 + 1$ and the line $y = -x + 3$ is revolved about the line $y = 5$ to generate a solid. Find the volume of that solid.

b.) Let R be the region bounded by the curve $y = x^2 + 1$ and the line $y = -x + 3$. Find the volume of the solid with base R and square cross sections perpendicular to the x-axis.

13.) a.) Find the Taylor series for the function $f(x) = e^x$ centered at the point $a = 2$. Determine its interval of convergence.

b.) Find the Maclaurin series for $f(x) = x^2e^{-x}$. Is this series convergent for $x = 2$? Explain.

14.) Determine whether each of the following series is convergent or divergent. Indicate test used.

$a.)\ \sum_{n=1}^{\infty} \frac{n}{n^3+1}$

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

$c.)\ \sum_{n=1}^{\infty} \frac{n^2}{2^n}$

$d.)\ \sum_{n=1}^{\infty} n^2 e^{-n^3}$

$e.)\ \sum_{n=1}^{\infty} \frac{1}{3^n-1}$