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Math 2B Final Exam Sample # 1

First Name:	
Last Name:	
Student ID #:	
Section:	
I certify that this exam was taken by the jincluding books, notes, calculators and c	person named and done without any form of assistance 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	

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

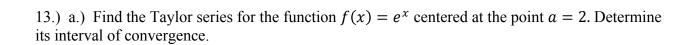
$$b.) b_n = n^3 e^{-n}$$

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

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.



b.) Find the Maclaurin series for $f(x) = x^2 e^{-x}$. 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.)
$$\sum_{n=1}^{\infty} n^2 e^{-n^3}$$

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