Test 1 MATH1680 S/2018

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Directions: *Below are 10 questions, each worth 10 points each. Some questions have multiple parts, and their point values are shown next to each part. Answer all questions completely. CIRCLE YOUR ANSWERS! Write only in the space provided. If more space is needed, use the back of each page.*

Question:	1	2	3	4	5	6	7	8	9	10	11	12	Total
Points:	10	10	10	10	10	10	10	10	10	10	0	0	100
Bonus Points:	0	0	0	0	0	0	0	0	0	0	5	5	10
Score:													

1. (10 points) Determine the length of $y = \ln(\sec x)$ between $0 \leq x \leq \pi/4$

2. Find the limit of each sequence:

   (a) (5 points) $\{\frac{e^{2n}}{n}\}_{n=1}^{\infty}$

   (b) (5 points) $\{\frac{(-1)^n}{n}\}_{n=1}^{\infty}$

3. (10 points) Review from Test 1: The line $y = x$ from $x = 0$ to $x = 1$ is rotated around the x-axis, forming a cone. Find the volume of this cone.

4. (10 points) Determine if the following series converges or diverges:

$$\sum_{n=1}^{\infty} \frac{n^2+2}{n^4+5}$$

5. (10 points) Determine the surface area of the solid formed by rotating $y = \sqrt{9-x^2}, -2 \leq x \leq 2$ about the x-axis.

6. (10 points) Determine if the following series is convergent or divergent.

$$\sum_{n=0}^{\infty} ne^{-n^2}$$

7. Find the sum of each series:

(a) (5 points) $\sum_{n=0}^{\infty} 2^n 3^{1-n}$

(b) (5 points) $\sum_{n=2}^{\infty} \frac{1}{n^2-1}$

8. (10 points) Determine the center of mass of a semicircular plate of radius r centered at the origin.

9. (10 points) A torus is formed by rotating a circle of radius r about a line in the plane of the circle that is a distance R (>r) from the center of the circle. Find the volume of the torus.

10. (10 points) Review from Test 2: Compute $\int \frac{1}{x^2-4} dx$

11. (5 points (bonus)) True/False: Must get all of these correct for points.

1. If the series $\sum a_n$ diverges, then the limit of $a_n = 0$.
2. Suppose f is a continuous, positive, decreasing function on $[1, \infty)$ and let $a_n = f(n)$. Then if $\sum a_n$ is divergent, then $\int_1^\infty f(x)dx$ is convergent.
3. Suppose that we have two series $\sum a_n$ and $\sum b_n$ with $a_n > 0, b_n > 0$ for all n and $a_n \leq b_n$ for all n. Then, if a_n is convergent, then so is b_n.
4. Suppose that we have two series $\sum a_n$ and $\sum b_n$ with both non-negative. If we have $c = \lim_{n\to\infty} \frac{a_n}{b_n}$ and if c is positive and finite, then both series converge to c.

12. (5 points (bonus)) Write 0.21212... as a fraction in lowest terms.