MAT 132 **Name (Print):** _____
Summer II 2019
Final exam - part I
08/12/19
Time Limit: 80 minutes ID number _____

Instructions

- This exam contains 13 pages (including this cover page) and 10 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.
- You may *not* use your books, notes, or any device that is capable of accessing the internet on this exam (e.g., smartphones, smartwatches, tablets). You may not use a calculator.
- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.
- **Mysterious or unsupported answers will not receive full credit**.

Problem	Points	Score
1	5	
2	1	
3	2	
4	2	
5	4	
6	1	
7	1	
8	1	
9	1	
10	2	
Total:	20	

1. Compute the following integrals

   (a) (1 point)

$$\int xe^{x^2}\ dx$$

   (b) (1 point)

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

(c) (2 points)

$$\int_0^1 \frac{1}{(x+2)(x+3)}\, dx$$

(d) (1 point)

$$\int_0^2 \frac{1}{x^2+4}\, dx$$

2. (1 point) Find the area of the region bounded by the curves $y = \cos(x)$ and $y = \sin(x)$, for $0 \leq x \leq \frac{\pi}{4}$.

3. (2 points) The region bounded by the curves $y = \sqrt{x},\ x > 0$ and $y = x^2$ is rotated about the the x-axis. Find the volume of the resulting solid.

4. (2 points) Use the arclength formula to find the length of the curve $y = \sqrt{4 - x^2}$, for $-2 \leq x \leq 2$.

5. Find the general solutions of the following differential equations

   (a) (1 point)

$$\frac{dy}{dx} = xy^2$$

   (b) (1 point)

$$y'' + 3y' + 2y = 0$$

(c) (1 point)

$$y'' + 6y + 9 = 0$$

(d) (1 point)

$$y'' + 16y = 0$$

6. (1 point) Use the Comparison Test to determine whether the following series converges.

$$\sum_{n=1}^{\infty} \frac{\ln(n+3)}{n}$$

7. (1 point) Use the Integral Test to determine whether the following series converges.

$$\sum_{n=1}^{\infty} \frac{1}{n^3}$$

8. (1 point) Use the Limit Comparison Test to determine whether the following series converges.

$$\sum_{n=1}^{\infty} \frac{n^2 - 2n + 1}{n^3 + 1}$$

9. (1 point) Use the Alternating Series Test to determine whether the following series converges.

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$$

10. (2 points) Use the Ratio Test to determine the radius of convergence of the following power series

$$\sum_{n=1}^{\infty} \frac{(3x+1)^n}{n^2+1}.$$