

MAT 132

Summer II 2019

Final exam - part II

08/15/19

Time Limit: 3 hours and 5 minutes

Name (Print): _____

ID number _____

Instructions

- This exam contains 12 pages (including this cover page) and 8 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	10	
2	4	
3	3	
4	3	
5	10	
6	4	
7	3	
8	3	
Total:	40	

1. Compute the following integrals

(a) (2 points)

$$\int \frac{\sin(\sqrt{x})}{\sqrt{x}} dx$$

(b) (2 points)

$$\int \cos^2(x) \sin^2(x) dx$$

(c) (3 points)

$$\int_1^2 \ln(x) \, dx$$

(d) (3 points)

$$\int_0^2 \frac{1}{x^2 + 5x + 6} \, dx$$

2. Consider the function

$$f : [1, \infty) \longrightarrow \mathbb{R},$$

given by

$$f(x) = \frac{1}{x}.$$

The graph of this function is rotated about the x -axis.

(a) (2 points) Find the surface area of the resulting surface by using the following formula:

$$A = \int_1^\infty f(x) \sqrt{1 + (f'(x))^2} \, dx$$

- (b) (2 points) Find the volume of the solid enclosed by this surface by using the disk method.

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3. (3 points) The region bounded by the curves $x = 0$, $y = x^2$, and $y = 1$ is rotated about the y -axis. Find the volume of the resulting solid by using the cylindrical shells method.

4. (3 points) Find the length of the curve given by the equation

$$9y^2 = 4(x + 1)^3,$$

and the constraints $0 \leq x \leq 1$, $y \geq 0$.

5. Find the general solutions of the following differential equations

(a) (2 points)

$$xy^2 - y'x^2 = 0$$

(b) (3 points)

$$y' + 3x^2y = e^{-x^3}$$

(c) (3 points)

$$y'' + 8y + 16 = 0$$

(d) (2 points)

$$y'' + 4y = 0$$

6. Determine whether the following series converges or diverges (clearly indicate the convergence test used). In case the series converges, you **do not** need to find its value.

(a) (2 points)

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

(b) (2 points)

$$\sum_{n=1}^{\infty} \frac{n}{n^3 + 4n - 3}$$

7. (3 points) Write the following function as a power series in x , and determine its radius and interval of convergence.

$$\sum_{n=1}^{\infty} \frac{x}{x^2 + 9}$$

8. (3 points) Use the Taylor series of the cosine to evaluate the following integral as a numerical series (that is, the end result should not contain references to the variable x).

$$\int_0^1 x \cos(x)^3 dx.$$