

Name: _____

Student ID: _____

Section: _____

Instructor: _____

Math 113 (Calculus II)

Final Exam Form A

Apr 18, 7:00 p.m.

Instructions:

- Work on scratch paper will not be graded.
- For questions 10 to 17, show all your work in the space provided.. Full credit will be given only if the necessary work is shown justifying your answer. Please write neatly.
- Should you have need for more space than is allotted to answer a question, use the back of the page the problem is on and indicate this fact.
- Simplify your answers. Expressions such as $\ln(1)$, e^0 , $\sin(\pi/2)$, etc. must be simplified for full credit.
- Calculators are not allowed.

For Instructor use only.

#	Possible	Earned
MC	24	
9	10	
10	7	
11	10	
12	7	
13a	7	
Sub	65	

#	Possible	Earned
13b	7	
14	7	
15	7	
16	7	
17	7	
Sub	35	
Total	100	

Multiple Choice. In the grid below fill in the correct answer to each question.

1. Here is a series $\sum_{k=1}^{\infty} \frac{(-1)^n}{n(n+1)}$. Which of the following is true?

- a) The series diverges by the alternating series test.
- b) The series converges conditionally by the ratio test.
- c) The series converges absolutely by the ratio test.
- d) The series diverges by the integral test but converges by the ratio test.
- e) The series converges conditionally by a limit comparison test.
- f) The series converges absolutely by a limit comparison test.
- g) The series neither diverges nor converges.
- h) None of the above.

2. Find the first four terms of the binomial series for $(1+x)^{1/3}$.

- a) $1 + x - \frac{1}{3}x^2 + \frac{1}{81}x^3$
- b) $1 + \frac{1}{3}x - \frac{1}{9}x^2 + \frac{5}{81}x^3$
- c) $1 + \frac{1}{6}x + \frac{1}{9}x^2 + \frac{2}{81}x^3$
- d) $1 + \frac{1}{3}x + \frac{1}{4}x^2 + \frac{1}{5}x^3$
- e) None of the above.

3. Find the interval of convergence of the power series

$$\sum_{k=1}^{\infty} (-1)^k 2^k \frac{x^k}{k}.$$

- a) $[-1, 1]$
- b) $[-2, 2]$
- c) $(-2, 2]$
- d) $(-\frac{1}{2}, \frac{1}{2}]$
- e) $[-\frac{1}{2}, \frac{1}{2})$
- f) $(-1, 1]$
- g) The series converges for all values of x .
- h) None of the above.

4. The length of the curve $y = \frac{2}{3}x^{3/2}$ for $x \in [0, 2]$ is

- a) $\frac{5}{3}\sqrt{5} - \frac{1}{3}$
- b) $\sqrt{5} - \frac{1}{2} \ln(\sqrt{5} - 2)$
- c) $2\sqrt{3} - \frac{2}{3}$
- d) $\frac{16}{3} - \frac{4}{3}\sqrt{2}$
- e) None of the above.

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Short Answer. Fill in the blank with the appropriate answer.

9. (10 points)

a. What is $\lim_{n \rightarrow \infty} \frac{\ln(1+n^2)}{n}$? _____

b. Find the first 4 terms of the power series of e^{x^2} centered at 0. _____

c. Let $f(x) = x^2 + 1$. Find the power series of f centered at 1. _____

d. What number equals $\sum_{k=0}^{\infty} \frac{1}{3^k}$? _____

e. Find $\lim_{n \rightarrow \infty} \frac{n^3 - 67}{n^3}$ _____

f. Identify $\int \sec(x) dx$. _____

g. What is the correct substitution to use in computing the integral, $\int_0^1 \sqrt{1-x^2} dx$? _____

h. Find the antiderivative, $\int x \cos(x) dx$. _____

i. What is the formula for the arc length of the graph of the function $y = f(x)$ for

$x \in [a, b]$? _____

j. In the integral $\int_0^1 (1+x^2)^{1/2} dx$ the substitution, $u = 1+x^2$ is used. Write the integral

which results. Do not try to work the integral. _____

Free Response. For problems 10 - 17, write your answers in the space provided. Use the back of the page if needed, indicating that fact. Neatly show all work.

10. (7 points) Determine whether the following series converges and explain your answer.

$$\sum_{n=1}^{\infty} \frac{\sqrt[3]{n^2 + 1}}{3n^2 + 2}$$

11. (10 points) Find the interval of convergence of the power series

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

12. (7 points) The graph of $y = x^2$ for $x \in [0, 2]$ is rotated about the y axis to form a tank that is filled with water, (64 pounds per cubic foot). Find the amount of work required to siphon all the water to the top of the tank.

13. Find

(a) (7 points) $\int \frac{dx}{x^2-3x+2}$

(b) (7 points) $\int x\sqrt{2x-3}dx$

14. (7 points) The region between $y = \ln x$ which lies between $x = 1$, $x = 2$, and the x axis is revolved about the line $x = -1$. Find the volume of the resulting solid of revolution.

15. (7 points) The base of a solid is the inside of the circle, $x^2 + y^2 \leq 9$. Cross sections perpendicular to the x axis are squares. Find the volume of the resulting solid.

16. (7 points) Determine whether the integral $\int_0^1 \frac{\sin(x)}{\sqrt{1-x^2}} dx$ converges.

17. (7 points) Find $\int_1^\infty \frac{1}{x(x^2+1)} dx$