MA 16020 **EXAM 2** **Form 01**

NAME_____ INSTRUCTOR_____

INSTRUCTIONS

1. Fill in your name and your instructor's name above.
2. You must use a #2 pencil on the scantron answer sheet.
3. Fill in your name, your four digit section number, "01" for the Test/Quiz Number, and your student identification number. Make sure to blacken in the appropriate spaces. If you do not know your section number, ask your instructor. Sign your name.
4. There are 15 questions. Blacken in your choice of the correct answer in the spaces provided on the scantron answer sheet. **Only the scantron answer sheet will be graded. When you have completed the exam, turn in the scantron answer sheet only. You may take the exam booklet with you.**
5. **The exam is self-explanatory. Do not ask your instructor any questions about the exam problems.**
6. **Only one-line calculators (any brand) are allowed. Cell phones and PDA's may not be used as a calculator and must be put away during the exam. NO BOOKS OR PAPERS ARE ALLOWED. Use the back of the test pages for scrap paper.**

GEOMETRIC SERIES

If $0 < |r| < 1$, then

$$\sum_{n=0}^{\infty} ar^n = \frac{a}{1-r}$$

TAYLOR SERIES

The Taylor series of $f(x)$ about $x = c$ is the power series

$$\sum_{n=0}^{\infty} a_n (x-c)^n \quad \textbf{where} \quad a_n = \frac{f^{(n)}(c)}{n!}$$

Examples:

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}, \ \textbf{for} \ -\infty < x < \infty; \qquad \ln x = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} (x-1)^n, \ \textbf{for} \ 0 < x \leq 2$$

VOLUME & SURFACE AREA

Right Circular Cylinder
$V = \pi r^2 h$
$SA = \begin{cases} 2\pi r^2 + 2\pi rh \\ \pi r^2 + 2\pi rh \end{cases}$

Sphere
$V = \frac{4}{3}\pi r^3$
$SA = 4\pi r^2$

Right Circular Cone
$V = \frac{1}{3}\pi r^2 h$
$SA = \pi r\sqrt{r^2 + h^2} + \pi r^2$

1. Use Integration by Parts to evaluate $\int (2x+1)\ln x dx$.

   A. $(x^2+x)\ln x - \frac{x^2}{2} - x + C$

   B. $\ln x[\frac{1}{2}\ x^2 + x - \frac{1}{3}\ x^3] + C$

   C. $\dfrac{2x+1}{x} - 2\ln|x| + C$

   D. $(2x+1)\ \frac{(\ln x)^2}{2} - \frac{1}{3}(\ln x)^3 + C$

   E. $\frac{(2x+1)^2}{4x} + C$

2. What do the level curves for $f(x,y) = \sqrt{y+x^2}$ look like?

   A. Point at the origin

   B. Lines

   C. Circles

   D. Parabolas

   E. Hyperbolas

3. Find the volume of the solid that results by revolving the region enclosed by the curves $y = 2x$, $x = 1$, $x = 2$, and $y = 0$ about the x-axis.

   A. $\dfrac{32}{3}\pi$

   B. $\dfrac{4}{3}\pi$

   C. $\dfrac{28}{3}\pi$

   D. $\dfrac{14}{3}\pi$

   E. 6π

4. Find the 2^{nd} Maclaurin polynomial for:

$$f(x) = e^x \sin(\pi x)$$

A. $\pi x + 2\pi x^2$

B. $x + (1 - \pi^2)x^2$

C. $\pi x + \pi x^2$

D. $1 + x + (1 - \pi^2)x^2$

E. $1 + \pi x + 2\pi x^2$

5. The revenue, in millions of dollars, for a company in year t is given by the function:

$$R(t) = 15e^{0.15t}, \quad 0 \leq t \leq 10$$

The cost, in millions of dollars, to run the company in year t is approximated by:

$$C(t) = 12e^{-0.02t}, \quad 0 \leq t \leq 10$$

where t is the number of years after January 1st the year 2000. What was the net profit for the company from January 1st the year 2000 until January 1st the year 2006? Round your answer to the nearest dollar.

A. \$3,256,968

B. \$78,112,573

C. \$120,154,100

D. \$213,808,049

E. \$239,407,359

6. Which of the following series converge?

I. $\frac{4}{3} - \frac{8}{9} + \frac{16}{27} - \frac{32}{81} + ...$

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

III. $\sum_{n=0}^{\infty} \frac{n!}{5^n}$

A. I only

B. II only

C. I and II only

D. II and III only

E. I, II, and III

7. If $f(x,y) = e^{x^2+5y} + \frac{x}{y} - 2y^3$, then what is f_{xy}?

A. $10xe^{x^2+5y} - \frac{1}{y^2}$

B. $10xe^{x^2+5y} - \frac{1}{y^2} - 6y^2$

C. $e^{x^2+5y} - \frac{1}{y^2}$

D. $e^{x^2+5y} - \frac{1}{y^2} - 6y^2$

E. $10xye^{x^2+5y} - \frac{1}{y^2}$

8. Find a power series for the function

$$f(x) = \frac{x^2}{1+x^2}$$

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

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

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

D. $\sum_{k=1}^{\infty}-x^{2k+1}$

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

9. Determine the interval of absolute convergence for the power series

$$\sum_{k=1}^{\infty}\frac{3^{2k}x^k}{k^3}$$

A. $-1/9 < x < 1/9$

B. $-1/3 < x < 1/3$

C. $-3 < x < 3$

D. $-9 < x < 9$

E. $-1/6 < x < 1/6$

10. Solve the following initial value problem using integration by parts: $\begin{cases} \dfrac{dy}{dx} = (3x+1)\sqrt{2x-3} \\ y = 0 \text{ when } x = 2 \end{cases}$

A. y=$\dfrac{(3x+1)(2x-3)^{3/2}}{3} - \dfrac{(2x-3)^{5/2}}{5} - \dfrac{32}{15}$

B. y=$(3x+1)(2x-3)^{3/2} - \dfrac{3(2x-3)^{5/2}}{5} - \dfrac{32}{5}$

C. y=$\dfrac{(3x+1)(2x-3)^{-1/2}}{2} - \dfrac{2(2x-3)^{-3/2}}{3} - \dfrac{5}{2}$

D. y=$\dfrac{(3x+1)^2(2x-3)^{1/2}}{6} - \dfrac{2(2x-3)^{-1/2}}{3} - \dfrac{1}{2}$

E. y=$\dfrac{(3x+1)^{1/2}(2x-3)}{2} - \dfrac{3(2x-3)^2}{2} - 2$

11. A function $f(x)$ can be represented by the Taylor series:

$$\sum_{n=0}^{\infty} \frac{(-1)^n 2^n}{3^{n+1}} (x-1)^n$$

What is the value of $f^{(3)}(1)$?

A. $\dfrac{8}{81}$

B. $\dfrac{16}{27}$

C. $-\dfrac{8}{27}$

D. $-\dfrac{8}{81}$

E. $-\dfrac{16}{27}$

12. Compute $\int_0^\infty \frac{x}{e^x} dx$.

A. 0

B. 1

C. $\frac{1}{e}$

D. e

E. The integral diverges.

13. Find the volume of the solid generated by revolving the region inside the circle $x^2 + y^2 = 25$ and to the right of the line $x = 4$ about the y-axis.

A. 27π

B. 18π

C. 54π

D. 36π

E. 108π

14. Suppose every year, Alistar makes a resolution to be more friendly. Accordingly, every January 1, he adds 2 people to his list of friends. However, remaining Alistar's friend is very difficult. The fraction of his friends which last for at least t years is

$$f(t) = 2^{-0.1t}$$

How many current friends will Alistar have on December 31 in the long run? (Round your answer to the nearest whole person.)

A. 16 friends

B. 32 friends

C. 14 friends

D. 56 friends

E. 28 friends

15. The velocity of a cyclist during an hour-long race is given by the function:

$$v(t) = 60te^{t/10} \text{ mi/hr}, \qquad 0 \leq t \leq 1$$

Assuming the cyclist starts from rest, what is the distance he traveled during the first 30 minutes of the race? Round your answer to two decimal places.

A. 3.12 miles

B. 6.80 miles

C. 7.75 miles

D. 16.04 miles

E. 32.08 miles

F14

MA 16020 Exam 2 – Answer Key

Question Number	Green Version Form 01
1	A
2	D
3	C
4	C
5	B
6	C
7	A
8	A
9	A
10	A
11	E
12	B
13	D
14	E
15	C

The exam is worth 120 points

Your score = #correct * 8 points