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 12 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:

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

VOLUME & SURFACE AREA

Right Circular Cylinder

$V = \pi r^2 h$

$$SA = \begin{cases} 2\pi r^2 + 2\pi r h \\ \pi r^2 + 2\pi r h \end{cases}$$

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. Find the domain of the function
$$f(x,y) = \frac{2y\ln(xy-1)}{2x-y}.$$

A. $\{(x,y) : y \neq 0,\ y > 2x, \text{ and } xy \neq 1\}$

B. $\{(x,y) : y > 2x \text{ and } xy \neq 1\}$

C. $\{(x,y) : y \neq 0 \text{ and } xy > 1\}$

D. $\{(x,y) : y \neq 2x \text{ and } xy > 1\}$

E. $\{(x,y) : y \neq 2x \text{ and } xy \neq 1\}$

2. Evaluate the indefinite integral.
$$\int \frac{\ln(2x)}{x^2}\, dx$$

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

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

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

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

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

3. Given $f(x, y) = \sin(x^2 y)$, find $f_{xy}(1, \frac{\pi}{3})$.

   A. $\frac{3-\pi\sqrt{3}}{3}$

   B. $\sqrt{3} - \frac{\pi}{3}$

   C. $-\frac{\sqrt{3}}{2}$

   D. $\frac{\pi\sqrt{3}}{3}$

   E. $1 - \frac{2\pi\sqrt{3}}{3}$

4. What is the radius of convergence of $\displaystyle\sum_{n=0}^{\infty} \frac{(-x)^n}{2^n}$?

   A. 0

   B. 1/4

   C. 1/2

   D. 2

   E. ∞

5. Find the integral that will give the volume of the solid generated by revolving the region bounded by the graphs of the equations about the line $y = 2$:

$$y = e^{-x}, \;\; y = 1, \;\; x = 1, \;\; x = 3$$

A. $\displaystyle\int_1^3 \pi[(1 - e^{-x})^2]dx$

B. $\displaystyle\int_{e^{-1}}^{e^{-3}} \pi[(1 - e^{-x})^2]dx$

C. $\displaystyle\int_{e^{-1}}^{e^{-3}} \pi[(2 - e^{-x})^2 - 1]dx$

D. $\displaystyle\int_1^3 \pi[(2 - e^{-x})^2 - 1]dx$

E. $\displaystyle\int_1^3 \pi e^{-2x} dx$

6. For what values of x does the series

$$\sum_{n=0}^{\infty} 9^n (4x - 2)^{2n}$$

converge?

A. $5/3 < x < 7/3$

B. $5/12 < x < 7/12$

C. $17/9 < x < 19/9$

D. $17/36 < x < 19/36$

E. $-3/4 < x < 3/4$

7. One day, a mouse scurries from its home in a straight line to a piece of cheese 15 yards away, and runs straight back to its home. The next day, the piece of cheese is 3 yards away and the mouse again scurries in a straight line to the cheese and back home. On the third day, the cheese is 3/5 yards away and the mouse runs to it and back home yet again. If the mouse repeats this process for infinitely many days, with the distance of the cheese getting shortened by a factor of one-fifth from the mouse's home each day, what is the total distance travelled by the mouse for the daily process of gathering the cheese?

   A. 187/10 yards
   B. 186/5 yards
   C. 112/3 yards
   D. 187/5 yards
   E. 75/2 yards

8. The price of a certain commodity in dollars per unit at time t (measured in weeks) is given by $p = 9 + 2e^{-2t} + te^{-2t}$.
   What is the average price of the commodity over the 4-week period from $t = 0$ to $t = 4$?

   A. 9.33
   B. 9.31
   C. 8.31
   D. 9.21
   E. 9.43

9. Find the second Taylor polynomial of $f(x) = xe^x$ centered at $c = 1$.

   A. $\frac{e}{2}(3x^2 - 2x + 1)$
   B. $e(x^2 - x + 1)$
   C. $2x^2 - 3x + 1$
   D. $\frac{e}{2}(3x^2 + 10x + 9)$
   E. $x^2 + 3x + 2$

10. After a baby boom, a country is predicted to have $\frac{\sin t}{t}$ thousands of births above the normal level, known as "echoes" of the boom, where t is the number of years after the baby boom. Using the first three terms of the Taylor series for the given function centered about $t = 0$, predict the thousands of births above the normal level 10 years after the boom starts. Round your answer to the nearest whole number.

    A. 6
    B. 68
    C. 47
    D. 101
    E. 83

11. Determine the power series for

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

.

A. $\sum_{n=0}^{\infty} (-2)^{2n} x^{2n}$

B. $\sum_{n=1}^{\infty} n 2^n x^n$

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

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

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

12. Evaluate the improper integral.

$$\int_0^{\infty} e^{-x} \cos x \; dx$$

A. 0

B. 1

C. $-\frac{1}{2}$

D. $-\frac{1}{4}$

E. $\frac{1}{2}$

MA 16020 Exam 2 – Answer Key

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

The exam is worth 120 points

Your score = #correct * 10 points