

MA 16100
EXAM 2 Green
March 7, 2016

NAME _____ YOUR TA'S NAME _____

STUDENT ID # _____ RECITATION TIME _____

1. You must use a #2 pencil on the mark-sense sheet (answer sheet).
2. Be sure the paper you are looking at right now is GREEN!
3. Write the following in the TEST/QUIZ NUMBER boxes (and blacken in the appropriate spaces below the boxes):

01
4. On the mark-sense sheet, fill in your TA's name and the course number.
5. Fill in your NAME and STUDENT IDENTIFICATION NUMBER and blacken in the appropriate spaces.
6. Fill in your four-digit SECTION NUMBER. If you do not know your section number, please ask your TA.
7. Sign the mark-sense sheet.
8. Fill in your name, etc. on this paper (above).
9. There are 12 questions, each worth 8 points (you will automatically earn 4 points for taking the exam). Blacken in your choice of the correct answer in the spaces provided for questions 1-12. Do all your work on the question sheets.
10. Turn in both the mark-sense sheets and the question sheets when you are finished.
11. If you finish the exam before 8:50, you may leave the room after turning in the scantron sheet and the exam booklet. You may not leave the room before 8:20.
If you don't finish before 8:50, you MUST REMAIN SEATED until your TA comes and collects your scantron sheet and your exam booklet.
12. NO CALCULATORS, PHONES, BOOKS, OR PAPERS ARE ALLOWED. Use the back of the test pages for scrap paper.

EXAM POLICIES

1. Students may not open the exam until instructed to do so.
2. Students must obey the orders and requests by all proctors, TAs, and lecturers.
3. No student may leave in the first 20 min or in the last 10 min of the exam.
4. Books, notes, calculators, or any electronic devices are not allowed on the exam, and they should not even be in sight in the exam room. Students may not look at anybody else's test, and may not communicate with anybody else except, if they have a question, with their TA or lecturer.
5. After time is called, the students have to put down all writing instruments and remain in their seats, while the TAs will collect the scantrons and the exams.
6. Any violation of these rules and any act of academic dishonesty may result in severe penalties. Additionally, all violators will be reported to the Office of the Dean of Students.

I have read and understand the exam rules stated above:

STUDENT NAME: _____

STUDENT SIGNATURE: _____

1. If $f(x) = \frac{1}{e} + \sqrt{x^3}e^{-x}$, find $f'(1)$.

- A. $\frac{3}{2e}$
- B. $\frac{1}{e}$
- C. $\frac{1}{2e}$
- D. $\frac{2}{3e}$
- E. $\frac{e-2}{2e^2}$

2. Given the following data:

$f(0) = -3$	$f(1) = 4$
$f'(0) = 2$	$f'(1) = 3$
$g(0) = 1$	$g(1) = 0$
$g'(0) = -1$	$g'(1) = -2$

If $h(x) = \frac{f(g(x))}{g(x)}$, find $h'(0)$.

- A. 7
- B. 2
- C. 4
- D. 3
- E. 1

3. For which θ and x are the following two equations true?

$$\cos^{-1}(\cos \theta) = \theta \quad \text{and} \quad \cos(\cos^{-1} x) = x$$

- A. $\frac{-\pi}{2} \leq \theta \leq \frac{\pi}{2}$ and $-1 \leq x \leq 1$
- B. $0 \leq \theta \leq \pi$ and $-\infty < x < \infty$
- C. $-\infty < \theta < \infty$ and $-1 \leq x \leq 1$
- D. $0 \leq \theta \leq \pi$ and $-1 \leq x \leq 1$
- E. $-1 \leq \theta \leq 1$ and $\frac{-\pi}{2} \leq x \leq \frac{\pi}{2}$

4. The position for the movement of a particle is given by

$$s = \cos(2t - 2) - \sin(3t - 3)$$

where s is measured in feet and t is measured in seconds. Find the acceleration of the particle after 1 second.

- A. -4 feet/sec²
- B. 2 feet/sec²
- C. -1 feet/sec²
- D. 5 feet/sec²
- E. 0 feet/sec²

5. Find the slope of the tangent line to the curve

$$x^2y^2 + \ln y = x^3 - 4$$

at the point $(2, 1)$.

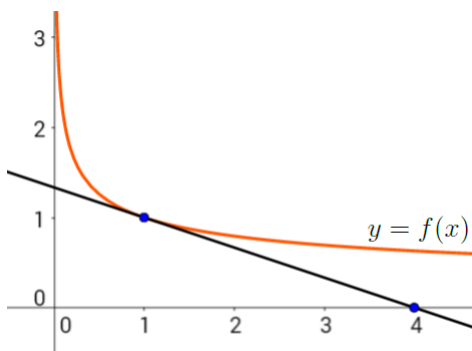
- A. $4/9$
- B. 0
- C. $2/3$
- D. 1
- E. $8/9$

6. If $y = \frac{1}{\tan^3 x}$, find $\frac{dy}{dx}$ at $x = \frac{5\pi}{3}$.

- A. -36
- B. $-4/3$
- C. $1/48$
- D. $1/36$
- E. $-1/12$

7. Suppose a is a positive number and the tangent line to $y = a^{x^2}$ at $x = 1$ has a slope of a . What is a ?
- A. e
 - B. \sqrt{e}
 - C. e^2
 - D. $\ln 2$
 - E. There is no such number a .

8. Below is the graph of $y = f(x)$ and its tangent line at $(1, 1)$. The tangent line also passes through $(4, 0)$.



Which one of these functions could be f ?

- A. $\frac{1}{\sqrt[3]{x}}$
- B. $\frac{1}{x}$
- C. $1 - \ln x$
- D. $\frac{1}{4x}$
- E. $\frac{1}{x^3}$

9. Find the derivative of $y = x^{\tan^{-1} x}$.

A. $\frac{x^{\tan^{-1} x} \ln x}{1 + x^2}$

B. $-x^{\tan^{-1} x} (\csc^2 x) (\ln x)$

C. $\frac{\tan^{-1} x}{x} + \frac{\ln x}{1 + x^2}$

D. $\frac{x^{\tan^{-1} x} \ln x}{1 + x^2} + \frac{x^{\tan^{-1} x} \tan^{-1} x}{x}$

E. $\frac{\tan^{-1} x}{x} - (\csc^2 x) \ln x$

10. The half-life of strontium-90 is 29 years. Suppose we have a 5 mg sample. Find the mass (in mg) that remains after t years.

A. $0.5e^{29t/\ln(5)}$

B. $0.5e^{t \ln(5)/29}$

C. $5e^{t \ln(0.5)/29}$

D. $5e^{29t \ln(0.5)}$

E. $5e^{29t/\ln(0.5)}$

11. Find the equation of the tangent line to $y = \sinh x$ at $x = \ln 3$.

A. $y = \frac{5}{3}(x - \ln 3) - \frac{4}{3}$

B. $y = \frac{4}{3}(x - \ln 3) - \frac{5}{3}$

C. $y = 3(x - \ln 3)$

D. $y = \frac{4}{3}(x - \ln 3) + \frac{5}{3}$

E. $y = \frac{5}{3}(x - \ln 3) + \frac{4}{3}$

12. A spherical balloon is inflated at the rate of 10 cubic centimeters per second. Find the rate at which the surface area is increasing when the surface area is 16 square centimeters.

Hint: Volume of a sphere, $V = \frac{S^{3/2}}{6\sqrt{\pi}}$, where S is the surface area.

A. $\frac{10}{\sqrt{\pi}}$ cm²/s

B. $\frac{32}{3\sqrt{\pi}}$ cm²/s

C. $10\sqrt{\pi}$ cm²/s

D. $\frac{1}{\sqrt{\pi}}$ cm²/s

E. $40\sqrt{\pi}$ cm/s