

MA 16100
EXAM 3 Green
November 12, 2015

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):

0 1

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. A spherical balloon is inflated at the rate of 8 cubic centimeters per second. Find the rate at which the radius is increasing when the radius is 5 centimeters.

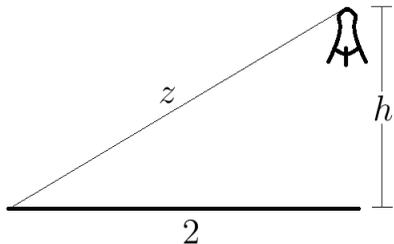
Hint: Volume of a sphere, $V = \frac{4}{3}\pi r^3$

- A. 100π cm/s
- B. 800π cm/s
- C. $\sqrt{\frac{2}{\pi}}$ cm/s
- D. $\frac{3}{50\pi}$ cm/s
- E. $\frac{2}{25\pi}$ cm/s

2. A spotlight on the ground shines on a wall 12 m away. If a man 1.8 m tall walks from the wall to the spotlight at a speed of 1 m/s, how fast is the length of his shadow on the wall changing when he is 3.6 m from the spotlight?

- A. $-\frac{6}{10}$ m/s
- B. $\frac{6}{10}$ m/s
- C. $\frac{10}{6}$ m/s
- D. $-\frac{10}{6}$ m/s
- E. 6 m/s

3. An observer is stationed 2 miles from a rocket launch pad. The rocket rises vertically off the launch pad. h denotes the height of the rocket (in miles), and z denotes the distance from the observer to the rocket (in miles). Find a formula for $\frac{dz}{dt}$.



- A. $\sqrt{2h \frac{dh}{dt}}$
B. $\sqrt{4 + \left(\frac{dh}{dt}\right)^2}$
C. $2h \frac{dh}{dt}$
D. $\frac{h \frac{dh}{dt}}{\sqrt{4 + h^2}}$
E. $\frac{2 + h \frac{dh}{dt}}{\sqrt{4 + h^2}}$

4. Find the approximate value of

$$\sqrt{25.1}$$

by considering the linear approximation of the function $f(x) = x^{\frac{1}{2}}$ at $x = 25$.

- A. 4.95
B. 5.01
C. 5.05
D. 5.10
E. 5.15

5. Let $f(x)$ be a polynomial with $f(2) = 1$. Assume that $f'(x) \geq 3$ for every x in $[2, 4]$. What is the smallest possible value of $f(4)$? *Hint: Apply the Mean Value Theorem.*

- A. 1
- B. 3
- C. 4
- D. 6
- E. 7

6. Find the absolute minimum value of $f(x) = 3x^3 - x$ on the closed interval $\left[-\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right]$.

- A. 0
- B. $-\frac{1}{\sqrt{3}}$
- C. $-\frac{1}{3}$
- D. $-\frac{2}{9}$
- E. There is no absolute minimum value.

7. Consider the function $f(x) = 1 + \frac{1}{x} - \frac{1}{x^2}$ for $x \neq 0$. This function has
- A. one local minimum and one point of inflection
 - B. one local maximum and one point of inflection
 - C. one local minimum and two points of inflection
 - D. one local maximum and two points of inflection
 - E. one local minimum, one local maximum, and two points of inflection

8. If $f(x) = xe^{bx^2}$, what is the value of the constant b such that $f(x)$ attains its maximum at $x = 2$?

- A. $b = -\frac{1}{2}$
- B. $b = \frac{1}{4}$
- C. $b = -\frac{1}{8}$
- D. $b = -1$
- E. $b = 1$

9. Find the point(s) of inflection of the function $f(x) = \ln(1 - \ln(x))$ on the interval $0 < x < e$.

A. $x = \ln 2$

B. $x = \sqrt{e}$

C. $x = \frac{1}{2}$ and $x = \frac{3}{2}$

D. $x = 2$

E. $x = 1$

10. Find the limit.

$$\lim_{x \rightarrow 1^+} (\ln x) \left(\tan \frac{\pi x}{2} \right)$$

A. $-\frac{2}{\pi}$

B. $-\frac{\pi}{2}$

C. 0

D. $-\infty$

E. ∞

11. Suppose $f''(x) = e^{x^2}$ and $f'(1) = 0$. At $x = 1$, f has

- A. A local maximum
- B. A local minimum
- C. An inflection point
- D. None of these
- E. Impossible to determine

12. Which of these curves is the graph of $y = 1 + 4x^5 - 5x^4$ between $x = 0$ and $x = 1$?

