MA 16100
EXAM 3 Form A
November 12, 2014

NAME _____  YOUR TA'S NAME _____

STUDENT ID # _____  RECITATION TIME _____

1. You must use a #2 pencil on the mark-sense sheet (answer sheet).

2. If the cover of your question booklet is GREEN, write 01 in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below. If the cover is ORANGE, write 02 in the TEST/QUIZ NUMBER boxes and darken the spaces below.

3. On the mark-sense sheet, fill in your TA's name and the course number.

4. Fill in your NAME and STUDENT IDENTIFICATION NUMBER and blacken in the appropriate spaces.

5. Fill in your four-digit SECTION NUMBER. If you do not know your section number, please ask your TA.

6. Sign the mark-sense sheet.

7. Fill in your name and your instructor's name on the question sheets above.

8. 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.

9. Turn in both the mark-sense sheets and the question sheets when you are finished.

10. If you finish the exam before 7:20, you may leave the room after turning in the scantron sheet and the exam booklet. If you don't finish before 7:20, you MUST REMAIN SEATED until your TA comes and collects your scantron sheet and your exam booklet.

11. NO CALCULATORS, PHONES, BOOKS, OR PAPERS ARE ALLOWED. Use the back of the test pages for scrap paper.

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# 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.
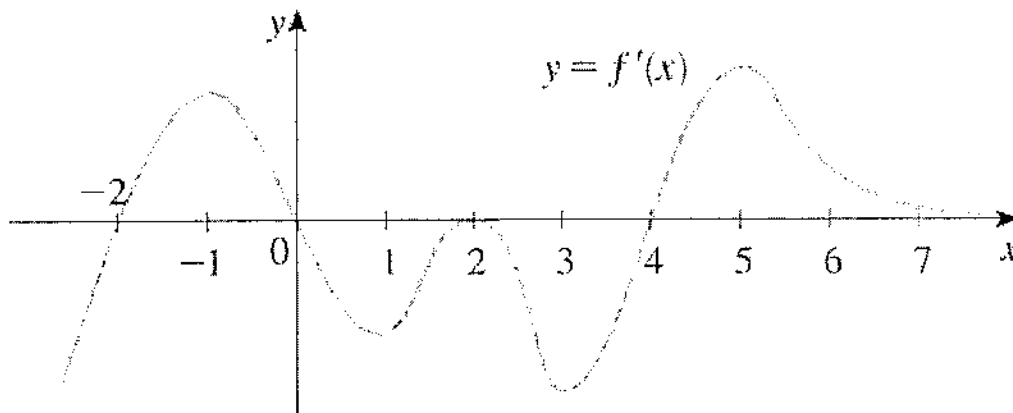
I have read and understand the exam rules stated above:


STUDENT NAME: _____


STUDENT SIGNATURE: _____

1. If $f(1) = 3$ and $f'(1) = 5$, use a linear approximation to estimate $f(0.99)$.

   A. 2.95
   B. 2.96
   C. 2.97
   D. 2.98
   E. 2.99

2. The graph of the **first derivative** $f'(x)$ of a function $f(x)$ is shown. On what intervals is $f(x)$ **decreasing**?



   A. $(-1, 1) \cup (2, 3) \cup (5, \infty)$
   B. $(-\infty, -1) \cup (1, 2) \cup (3, 5)$
   C. $(-\infty, 0) \cup (1.5, 2.5) \cup (4.5, 5.5)$
   D. $(-2, 0) \cup (4, \infty)$
   E. $(-\infty, -2) \cup (0, 2) \cup (2, 4)$

**3.** Let $f(x) = -x^3 + 3x + 6$. Let $M$ be the absolute maximum value of $f(x)$ and $m$ the absolute minimum value of $f(x)$ on $[-2,3]$. What is $M - m$ ?

A. 4

B. 28

C. 20

D. 8

E. 16

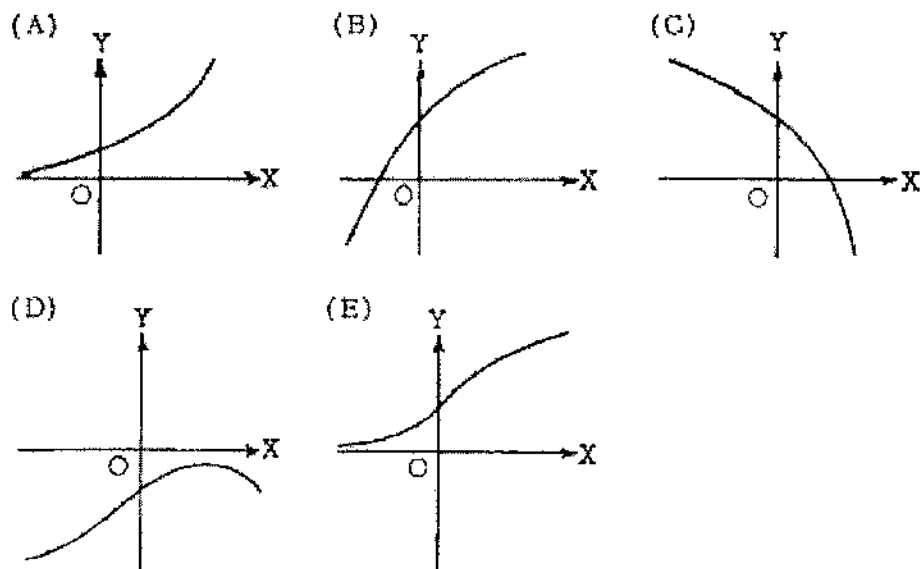**4.** What is the maximum value of $f(x) = \sqrt{3}\sin x + \cos x$ on $[0, \pi]$?

A. $\sqrt{3}$

B. $1/2$

C. 1

D. 2

E. $\sqrt{3} + 1$

**5.** A particle moves along the $x$ axis with a position function $x(t)$ with $x(0) = 3$. What is the largest possible positive value for $x(5)$ if $x'(t) \leq 7$ for all $t \geq 0$?

A. 7

B. 10

C. 32

D. 38

E. 5

**6.** If $y$ is a function of $x$ such that $y' > 0$ for all $x$ and $y'' < 0$ for all $x$. which of the following could be part of the graph of $y = f(x)$?



(A)　(B)　(C)

(D)　(E)

7. The graph of a twice-differentiable function $f$ is show in the figure below. Which of the following is true?
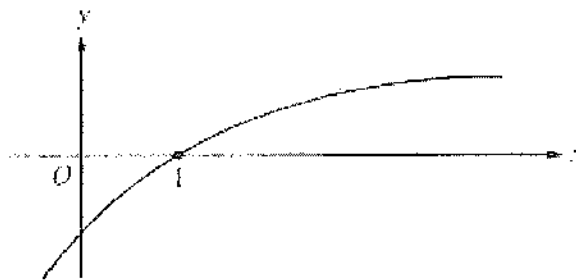


A. $f(1) < f'(1) < f''(1)$

B. $f(1) < f''(1) < f'(1)$

C. $f'(1) < f(1) < f''(1)$

D. $f''(1) < f(1) < f'(1)$

E. $f''(1) < f'(1) < f(1)$

8. If $f(3) = 5$, $f'(3) = 0$, and $f''(3) = -2$, which of the following statements must be true about the point $(3, 5)$? You may assume that $f(x)$, $f'(x)$, and $f''(x)$ are continuous for all $x$.

  I. $f$ has a local maximum there

  II. $f$ has a local minimum there

  III. The graph is concave upward in the neighborhood of $(3, 5)$

  IV. The graph is concave downward in the neighborhood of $(3, 5)$

  V. The tangent line at $(3, 5)$ is horizontal

A. II, III, and V

B. I, IV, and V

C. II, IV, and V

D. I and III

E. II and IV

**9.** Consider the function $f(x) = xe^{2x}$. Which of the following statements are true?

(1) $f$ is increasing on $(-\frac{1}{2}, \infty)$.

(2) $f$ is concave down on $(-\infty, -1)$.

(3) $f$ has one local maximum on $(-\infty, \infty)$.

A. (1), (2), and (3)

B. (3) only

C. (1) and (2)

D. (1) only

E. (2) and (3)

**10.** Compute the limit $\lim\limits_{x \to 0}(1 + 2x)^{3/x}$.

A. 3

B. 6

C. $3e^2$

D. $e^3$

E. $e^6$

11. Compute the limit $\lim\limits_{x \to 0+} \dfrac{\sin x}{e^x}$

    A. 0

    B. 1

    C. $\infty$

    D. $\dfrac{1}{e}$

    E. DNE

12. Find $\lim\limits_{x \to 0+} x(\ln x)^2$.

    A. 1

    B. $-2$

    C. 2

    D. $\infty$

    E. 0