MA 16100
EXAM 3 Form A
April 6, 2017

NAME _____ YOUR TA'S NAME _____

STUDENT ID # _____ RECITATION TIME _____

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

2. On the scantron, write ⌐01⌐ in the TEST/QUIZ NUMBER boxes and blacken in the appropriate spaces below.

3. On the scantron, 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. BE SURE TO INCLUDE THE TWO LEADING ZEROS.

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

6. Sign the scantron.

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 scantron and the exam booklet when you are finished.

10. You cannot turn in your exam during the first 20 min or the last 10 min of the exam period.

11. 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 be put away and should not be visible at all. 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 $f(x) = e^{x+1}\cosh x$, find $f'(0)$

    A. e

    B. $-e$

    C. $2e$

    D. $-2e$

    E. 0

2. The position of a particle is given by $s(t) = t^3 - 6t^2 + 12t - 8$, $t > 0$, where t is in seconds and s is in meters. The particle is **slowing down** for which interval(s) of t?

    A. $(2, \infty)$ only

    B. $(0, 3)$ only

    C. $(0, 2)$ only

    D. $(0, \infty)$ only

    E. $(0, 1)$ and $(2, \infty)$

3. A spherical balloon is inflated at a constant rate of 40 in^3/s. How fast, in in/s, is the radius of the balloon increasing when the radius is 6 in? Recall the volume of a sphere is $V = \frac{4}{3}\pi r^3$.

A. $\dfrac{18\pi}{5}$

B. $\dfrac{5}{18\pi}$

C. $\dfrac{5}{6\pi}$

D. $\dfrac{5}{3\pi}$

E. 144π

4. A kite at a constant altitude of 100 ft above the ground moves horizontally at an unknown but constant speed. When 200 ft of string has been let out, the angle between the string and the ground is decreasing at $\dfrac{1}{40}$ rad/s. How fast, in ft/s, is the kite moving?

A. 5

B. 10

C. 15

D. 20

E. 25

5. Use a linear approximation to estimate $8.06^{2/3}$.

    A. 4

    B. 4.01

    C. 4.019

    D. 4.02

    E. 4.021

6. Find the absolute maximum value of $f(x) = \dfrac{x+1}{x^2+3}$ on the interval $[-2, 3]$.

    A. $1/3$

    B. $3/7$
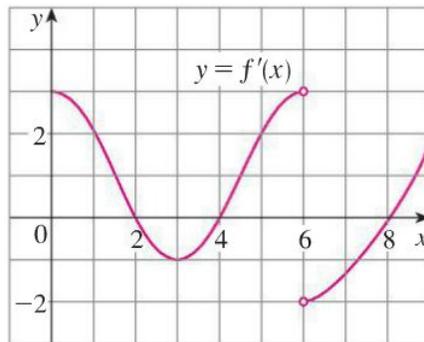
    C. $(\sqrt{2}+1)/5$

    D. $1/2$

    E. $8/13$

7. Polonium-210 has a half-life of 5 days. A sample originally has a mass of 800 mg. What is the mass after 115 days?

A. $800(1/2)^{23}$ mg

B. $800(1/2)^{115}$ mg

C. $800e^{(575/2)}$ mg

D. $800(1/2)^{575}$ mg

E. $800e^{(23/2)}$ mg

8. If $f(4) = 10$ and $f'(x) \geq 3$ for $2 \leq x \leq 4$, then the Mean Value Theorem guarantees $f(2)$ can be **no bigger** than

A. 1

B. 2

C. 4

D. 8

E. 16

9. The graph of the **first derivative** of a function $f(x)$ is shown. Which of the statements below is/are correct?

    (I) $f(x)$ is concave downward on $(5, 6)$

   (II) $f(x)$ is decreasing on $(2, 4)$

  (III) $f(x)$ has a local maximum at $x = 2$

A. I only

B. II only

C. I and II

D. II and III

E. I and III

10. Find the locations (x values) of the inflection points of $f(x) = e^{-x^2}$. Note that its first and second derivatives are: $f'(x) = -2xe^{-x^2}$, $f''(x) = (4x^2 - 2)e^{-x^2}$.

A. $x = 1$ and $x = -1$

B. $x = 2$ and $x = -2$

C. $x = 0$

D. $x = \sqrt{2}$ and $x = -\sqrt{2}$

E. $x = \frac{1}{\sqrt{2}}$ and $x = \frac{-1}{\sqrt{2}}$

11. The function $f(x) = x^4 - 4x^2$ has

A. one relative minimum and
   two relative maxima

B. one relative minimum and
   one relative maximum

C. two relative maxima and
   no relative minimum

D. two relative minima and
   no relative maximum

E. two relative minima and
   one relative maximum

12.
$$\lim_{x \to 0} (1 + 2x)^{\cot x} =$$

A. 0
B. 1
C. 2
D. e
E. e^2