MA 16100
EXAM 3 Version 01
November 16, 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 TA'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. A particle moves along the graph of $y = \sqrt{3 + x^3}$. As it reaches the point $(1, 2)$, the y coordinate is increasing at a rate of 3 units/sec. How fast is the x coordinate of the point increasing at that instant?

A. 1 unit/sec

B. 2 units/sec

C. 3 units/sec

D. 4 units/sec

E. 5 units/sec

2. An inverted cone (that is, the point of the cone is at the bottom) has base radius 4 feet and height 8 feet. Water is being pumped into it at a rate of 12 cubic feet per minute. How fast is the water level rising at a time when the water in the cone is 4 feet deep? **NOTE:** the volume of a cone with base radius r and height h is $\frac{1}{3}\pi r^2 h$.

A. $\dfrac{1}{\pi}$ feet per minute

B. $\dfrac{2}{\pi}$ feet per minute

C. $\dfrac{3}{\pi}$ feet per minute

D. $\dfrac{4}{\pi}$ feet per minute

E. $\dfrac{5}{\pi}$ feet per minute

3. Use linear approximation to estimate $\sqrt{100.2}$

A. 10

B. 10.01

C. 10.02

D. 10.1

E. 10.2

4. Find the absolute minimum (m) and the absolute maximum (M) of the function $f(x) = \dfrac{\ln x}{x^2}$ on the interval $\left[\frac{1}{e}, e\right]$

A. $m = -e^2$, $M = \dfrac{1}{e^2}$

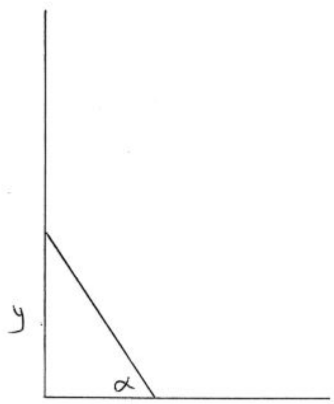
B. $m = -e^2$, $M = \dfrac{1}{2e}$

C. $m = \dfrac{1}{e^2}$, $M = \dfrac{1}{2e}$

D. $m = -e^2$, there is no absolute maximum

E. there is no absolute minimum, $M = \dfrac{1}{e^2}$

5. A ladder 5 feet long rests against a vertical wall. The top of the ladder is sliding down the wall. At a certain time, y is 4 feet and the angle α is decreasing at a rate of 2 radians/minute. How fast is y decreasing at that time?



A. 2 feet per minute

B. 3 feet per minute

C. 4 feet per minute

D. 5 feet per minute

E. 6 feet per minute

6. Find the number c that satisfies the conclusion of the Mean Value Theorem for the function $f(x) = x^2$ on the interval $[0, 8]$ (that is, $a = 0$ and $b = 8$).

A. 2

B. 3

C. 4

D. 5

E. 6

7. How many inflection points does the graph of $y = \dfrac{1}{12}x^4 - \dfrac{1}{3}x^3 + \dfrac{1}{2}x^2$ have?

A. 0
B. 1
C. 2
D. 3
E. 4

8. The function $f(x) = \sqrt{x} - \sqrt[4]{x}$ has

A. a local minimum at $x = \frac{1}{4}$
B. a local maximum at $x = \frac{1}{4}$
C. a local minimum at $x = \frac{1}{8}$
D. a local maximum at $x = \frac{1}{16}$
E. a local minimum at $x = \frac{1}{16}$

9. The function $f(x) = (x^2+1)e^{-x}$ has first derivative $f'(x) = -e^{-x}(x-1)^2$ and second derivative $f''(x) = e^{-x}(x^2-4x+3)$. The graph of $f(x)$ is concave **downward** on

A. $(-\infty, 1)$
B. $(-\infty, 3)$
C. $(1, 3)$
D. $(1, \infty)$
E. $(3, \infty)$

10. Evaluate

$$\lim_{x \to 0} \frac{\ln(e^3+3x)-3}{x}$$

A. $\dfrac{1}{e^3}$
B. $\dfrac{3}{e^3}$
C. 3
D. e^3
E. The limit does not exist

11. Evaluate

$$\lim_{x \to 0^+} (1 + \sin 3x)^{1/x}$$

A. 1

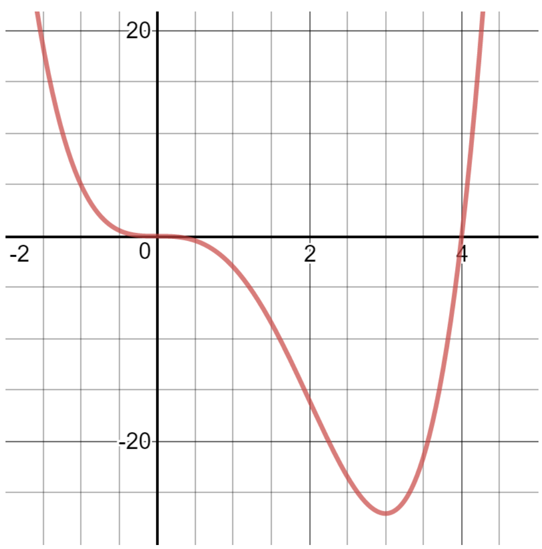
B. e

C. 3

D. e^3

E. $e^{\sin 3x}$

12. The graph of $y = f(x)$ is shown below. Which set of conditions are satisfied by the graph?



A. $f''(x) < 0$ if $0 < x < 2$, $f''(x) > 0$ if $x < 0$ or $x > 2$

B. $f''(x) < 0$ if $x > 3$, $f''(x) > 0$ if $x < 3$

C. $f''(x) < 0$ if $x < 0$ or $x > 2$, $f''(x) > 0$ if $0 < x < 2$

D. $f''(x) < 0$ if $x < 3$, $f''(x) > 0$ if $x > 3$

E. $f''(x) < 0$ if $x < 2$, $f''(x) > 0$ if $x > 2$