MA 16100
EXAM 3 Green
November 15, 2018

NAME _____ YOUR TA'S NAME _____

STUDENT ID # _____ RECITATION TIME _____

Write the following in the TEST/QUIZ NUMBER boxes: **00** (and blacken in the appropriate digits below the boxes)
You must use a #2 pencil on the mark–sense sheet (answer sheet).On the mark–sense sheet, fill in your TA's name and the COURSE number. Fill in your NAME and STUDENT IDENTIFICATION NUMBER and blacken in the appropriate spaces. Fill in your four-digit SECTION NUMBER. If you do not know your section number, ask your TA. Sign the mark–sense sheet.
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 in this exam booklet. Use the back of the test pages for scrap paper. Turn in both the mark–sense sheet and the exam booklet when you are finished.
If you finish the exam before 7:20, you may leave the room after turning in the scantron sheet and the exam booklet. You may not leave the room before 6:50. 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.

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. Compute the limit. $\lim_{x\to\pi} \dfrac{\sin(x-\pi)}{x^2+4\pi x-5\pi^2}$

A. $\dfrac{1}{6\pi}$

B. $\dfrac{1}{2\pi}$

C. $-\dfrac{1}{2\pi}$

D. 0

E. $-\dfrac{1}{4\pi}$

2. Compute the limit. $\lim_{x\to 0} (1-2x)^{1/x}$

A. e^2

B. 1

C. -2

D. 2

E. e^{-2}

3. If each edge of a cube is increasing at a constant rate of 3 cm/s, how fast is the volume of the cube increasing when the length of each edge is 10 cm?

A. 270 cm^3/s

B. 300 cm^3/s

C. 900 cm^3/s

D. 27 cm^3/s

E. 3000 cm^3/s

4. Using differentials (linear approximation) to estimate $\sqrt{9.1}$, the approximate value is

A. $3\frac{1}{30}$

B. 3.01

C. $3\frac{1}{6}$

D. $3\frac{1}{60}$

E. 3.033

5. You are the owner of a rectangular orchard adjacent to a straight river. You have 1000 ft of fence that you want to use to enclose it. No fencing is required along the river. If x is the length of a side perpendicular to the river and y is the length of the side parallel to the river, find the values of x and y that will maximize the enclosed area.

A. $x = 400,\ y = 200$

B. $x = 250,\ y = 500$

C. $x = 200,\ y = 600$

D. $x = 250,\ y = 750$

E. None of the above

6. Let f be a function whose derivative is given by

$$f'(x) = (x-1)(x+3)(x-4).$$

The function f has

A. Local maxima at $x = -3$ and $x = 1$ and a local minimum at $x = 4$.

B. Local maxima at $x = 1$ and $x = 4$ and a local minimum at $x = -3$.

C. Local maxima at $x = -3$ and $x = 4$ and a local minimum at $x = 1$.

D. A local maximum at $x = 4$ and local minima at $x = -3$ and $x = 1$.

E. A local maximum at $x = 1$ and local minima at $x = -3$ and $x = 4$.

7. On the open interval $(2, 3)$, the function $f(x) = x^3 - 6x^2 + 9x + 30$ is

A. Increasing and concave up

B. Decreasing and concave down

C. Increasing and concave down

D. Decreasing and concave up

E. None of the above are true for the entire interval

8. Find the point of inflection of the function

$$f(x) = \frac{\ln x}{x}$$

A. $\left(e^{1/2}, \dfrac{1}{2e^{1/2}}\right)$

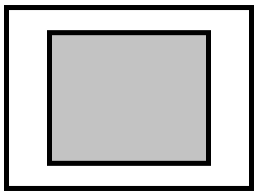
B. $\left(e^{3/2}, \dfrac{3}{2e^{3/2}}\right)$

C. $(1, 0)$

D. $\left(e, \dfrac{1}{e}\right)$

E. $\left(e^3, \dfrac{3}{e^3}\right)$

9. The top and bottom margins of a poster are each 1 inch and the side margins are each 2 inches. If the area of printed material on the poster is fixed at 32 square inches, find the smallest possible area of the entire poster.



A. 72 square inches

B. 80 square inches

C. 64 square inches

D. 96 square inches

E. 76 square inches

10. Consider the function $f(x) = x^{2/3}$ restricted to the domain $[-1, 1]$. Which one of the following statements is FALSE?

A. On the domain $[-1, 1]$, f attains an absolute minimum value.

B. $x = 0$ is a critical number for f.

C. $f(x) \leq 1$ on the domain $[-1, 1]$.

D. There exists a c between 0 and 1 where $f'(c) = 1$.

E. Since $f(-1) = f(1)$, there exists a c between -1 and 1 where $f'(c) = 0$.

11. An ideal gas at a fixed temperature satisfies the equation

$$pV = C,$$

where p is pressure (measured in pascal, $pa = \frac{J}{m^3}$), V is volume (m^3), and C is held constant at $7200J$. At a certain instant this gas occupies a volume of $3m^3$, and the pressure is increasing at a rate of $2\frac{pa}{s}$. Find the rate of change of the volume at this instant.

A. $-\dfrac{1}{800}\ \frac{m^3}{s}$

B. $-\dfrac{1}{1200}\ \frac{m^3}{s}$

C. $-\dfrac{1}{400}\ \frac{m^3}{s}$

D. $-\dfrac{2}{3}\ \frac{m^3}{s}$

E. $-3\ \frac{m^3}{s}$

12. Find the shape of the graph of $y = 3x^4 - 8x^3$.