

MA 16100  
EXAM 2 Green  
October 17, 2019

NAME \_\_\_\_\_ YOUR TA'S NAME \_\_\_\_\_

STUDENT ID # \_\_\_\_\_ RECITATION TIME \_\_\_\_\_

Write the following in the TEST/QUIZ NUMBER boxes:  (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 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.

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. Suppose

$$y = \frac{8x^2e^x}{e^x + x^2}.$$

Then  $\frac{dy}{dx}$  at  $x = 0$  is:

- A. 0
- B. -16
- C. 1
- D. -1
- E. 16

2. Find  $f'(x)$  for  $x \neq 0$  if

$$f(x) = \frac{4x^3 - 10x^2}{\sqrt{x}}$$

- A.  $6x^2\sqrt{x} - 10\sqrt{x}$
- B.  $10x\sqrt{x} - 15\sqrt{x}$
- C.  $24x^2\sqrt{x} - 40x\sqrt{x}$
- D.  $4x^2\sqrt{x} - 10x\sqrt{x}$
- E.  $12x\sqrt{x} - 20\sqrt{x}$

3. Find the equation of the line tangent to

$$f(x) = \frac{\cos(x)}{1 - \cos(x)} \quad \text{at } x = \frac{\pi}{3}$$

- A.  $y - 1 = -2\sqrt{3}(x - \frac{\pi}{3})$
- B.  $y - 1 = \sqrt{3}(x - \frac{\pi}{3})$
- C.  $y - 1 = -\frac{1}{2}(x - \frac{\pi}{3})$
- D.  $y - 1 = 2\sqrt{3}(x - \frac{\pi}{3})$
- E.  $y - 1 = -\sqrt{3}(x - \frac{\pi}{3})$

4. Suppose a stone is launched vertically upward with initial velocity 32 ft/sec from a height of 48 ft above ground. After  $t$  seconds its height is given by

$$s(t) = -16t^2 + 32t + 48$$

At the time when the stone hits the ground it is moving with a speed of

- A. 32 ft/s
- B. 24 ft/s
- C. 64 ft/s
- D. 48 ft/s
- E. 96 ft/s

5. Find the slope of the line tangent to

$$y = e^{\cot(x/2)}$$

at  $\left(\frac{\pi}{2}, e\right)$ .

- A.  $2e$
- B.  $-e$
- C.  $-2e$
- D.  $0$
- E.  $e$

6. Suppose

$$f(1) = 1, \quad f'(1) = 2, \quad f''(1) = 3.$$

If  $g(x) = f(x^2)$ , then  $g''(1) =$

- A. 4
- B. 6
- C. 12
- D. 16
- E. 10

7. Find the slope of the curve

$$2 \cos(xy) = \ln y$$

at  $\left(\frac{\pi}{2}, 1\right)$ .

- A.  $-\frac{2}{1+\pi}$
- B.  $-2$
- C.  $-2 - \pi$
- D.  $-2\pi$
- E.  $-\frac{3}{\pi}$

8. Where does  $y = x^{\sqrt{x}}$  have a horizontal tangent line?

- A. At  $x = 1/e$
- B. Such a value of  $x$  does not exist.
- C. At  $x = \ln 2$
- D. At  $x = 1/e^2$
- E. At  $x = 1$

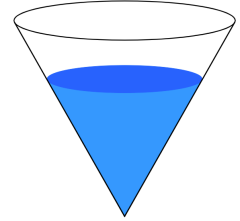
9. Find the derivative of  $\tan^{-1}\sqrt{x}$  when  $x = 4$ .

- A.  $1/5$
- B.  $1/15$
- C.  $1/20$
- D.  $1/10$
- E.  $1/25$

10. Suppose  $f(x) = x^3 + x$ . Find the slope of the tangent line to the graph of  $y = f^{-1}(x)$  at the point  $(2, 1)$ .

- A.  $1/12$
- B.  $1/10$
- C.  $1/2$
- D.  $1/13$
- E.  $1/4$

11. An inverted conical tank with a height of 8 feet and a radius of 4 feet is drained through a hole in the vertex at a rate of 12 cubic feet per second. What is the rate of change of the water depth when the water depth is 2 feet? (Note: the volume of a cone with base radius  $r$  and height  $h$  is  $\frac{1}{3}\pi r^2 h$ )



- A.  $-6/\pi$  feet per second  
B.  $-1/\pi$  feet per second  
C.  $-12/\pi$  feet per second  
D.  $-4/\pi$  feet per second  
E.  $-8/\pi$  feet per second
12. A bug is moving along the line  $y = 2x + 1$ . Let  $f(t)$  be its distance from the origin at time  $t$ . At a certain time  $t_0$ ,  $f'(t_0) = 7$  and  $x = 1$ . What is  $\frac{dx}{dt}$  at that time?
- A.  $6\sqrt{10}$   
B.  $4\sqrt{10}$   
C.  $3\sqrt{10}$   
D.  $7\sqrt{10}$   
E.  $\sqrt{10}$