

MA 16100  
EXAM 2(Version 11)  
(October 21, 2021)

NAME \_\_\_\_\_ YOUR TA's NAME \_\_\_\_\_

PUID # \_\_\_\_\_ RECITATION TIME \_\_\_\_\_

Write the following in the TEST/QUIZ NUMBER boxes: 

11
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 (and blacken 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 PUID NUMBER and blacken 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 automatically earn 4 points for taking the exam, for a total of 100 points. Blacken in your choice of the correct answer in the spaces provided for questions 1-12. Do all your work in the exam booklet, and also circle the answers in the exam booklet in case of a lost mark-sense sheet. 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 8:50pm you may leave the room after turning in the mark-sense sheet and exam booklet. You may not leave the room before 8:20pm. If you don't finish before 8:50pm you MUST REMAIN SEATED until your TA comes and collects your mark-sense 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, TA, 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 mark-sense sheets and 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 the equation of the line tangent to  $y = \frac{x}{2x+1}$  at the point  $x = 1$  is  $y = ax + b$ , what is  $b - a$ ?

A.  $-\frac{2}{9}$

B.  $\frac{2}{9}$

C.  $\frac{1}{9}$

D.  $-\frac{4}{9}$

E.  $-\frac{1}{9}$

2. Suppose

$$y = \frac{t^2 e^{-t}}{t^{1/2} + 1}$$

Find  $\frac{dy}{dt}$  at  $t = 1$ .

A.  $\frac{11}{8e}$

B.  $\frac{3}{8e}$

C.  $\frac{5}{8e}$

D.  $\frac{9}{8e}$

E.  $\frac{7}{8e}$

3. Suppose the tangent line to  $y = f(x)$  at  $x = 3$  is

$$y = 2x - 1.$$

Find  $\frac{d}{dx} \left( \frac{x^2}{f(x)} \right)$  when  $x = 3$ .

- A.  $\frac{16}{25}$
- B.  $\frac{12}{25}$
- C.  $\frac{11}{25}$
- D.  $\frac{17}{25}$
- E.  $\frac{13}{25}$

4. Evaluate the limit:

$$\lim_{x \rightarrow 0} \frac{\cot(5x) \cos(5x)}{\cot(3x) \cos(3x)}$$

- A.  $\frac{9}{25}$
- B.  $\frac{5}{3}$
- C. The limit is not defined.
- D.  $\frac{3}{5}$
- E.  $\frac{25}{9}$

5. Suppose a baseball is thrown vertically upward at time  $t = 0$  and that after  $t$  seconds its height above the ground is

$$s(t) = -5t^2 + 10t + 40.$$

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

- A. 30 m/s
  - B. 50 m/s
  - C. 20 m/s
  - D. 40 m/s
  - E. 10 m/s
6. Suppose  $h(x) = f(g(x))$ . Use the following table to compute the value of  $h'(1)$

	$x = 1$	$x = 2$	$x = 3$	$x = 4$
$f(x)$	3	4	1	2
$f'(x)$	$\frac{1}{3}$	$\frac{5}{2}$	$-\frac{1}{3}$	-6
$g(x)$	2	3	4	2
$g'(x)$	$\frac{7}{9}$	$-\frac{4}{9}$	$-\frac{2}{9}$	$\frac{5}{9}$

- A.  $-\frac{28}{9}$
- B.  $\frac{5}{6}$
- C.  $-\frac{2}{27}$
- D.  $-\frac{4}{3}$
- E.  $\frac{35}{18}$

7. If  $f(x) = e^{5x} \cos 2x$ , find  $f'(\frac{\pi}{8})$

A.  $\frac{5\sqrt{2}}{2}e^{5\pi/8}$

B.  $\frac{\sqrt{2}}{2}e^{5\pi/8}$

C.  $\frac{7\sqrt{2}}{2}e^{5\pi/8}$

D.  $\frac{3\sqrt{2}}{2}e^{5\pi/8}$

E.  $\frac{9\sqrt{2}}{2}e^{5\pi/8}$

8. If  $f(x) = \cos(\pi e^{3x})$ , find  $f'(\frac{1}{3} \ln \frac{1}{2})$ .

A.  $-\frac{3\pi}{2}$

B.  $-\frac{9\pi}{2}$

C.  $-\frac{9\pi}{8}$

D.  $-\frac{3\pi}{8}$

E.  $-\frac{9\pi}{4}$

9. If  $f(x) = x^2e^{3x}$ , find the second derivative  $f''(1)$ .

- A.  $17e^3$
- B.  $25e^3$
- C.  $21e^3$
- D.  $19e^3$
- E.  $23e^3$

10. The slope of the line tangent to the curve described by the implicit function

$$4(x^2 + y^2)^2 = 25xy^2$$

at the point  $(1, 2)$  is:

- A.  $-\frac{4}{3}$
- B.  $\frac{1}{3}$
- C.  $-\frac{2}{3}$
- D.  $-\frac{1}{3}$
- E.  $\frac{2}{3}$

11. If  $f(x) = x^{\ln(x)}$  find  $f'(e^2)$

- A.  $4e$
- B.  $2e^2$
- C.  $4e^2$
- D.  $e$
- E.  $2e$

12. Find the derivative of  $f(x) = \tan^{-1}(3x^2 - 1)$  when  $x = 1$

- A.  $\frac{6}{5}$
- B.  $\frac{5}{7}$
- C.  $\frac{1}{5}$
- D.  $\frac{3}{4}$
- E.  $\frac{8}{17}$