MA 16100
EXAM 1 Green
September 19, 2019

NAME —————————————— YOUR TA'S NAME ——————————————

STUDENT ID # —————————— RECITATION TIME ——————————

Write the following in the TEST/QUIZ NUMBER boxes: $\boxed{\textbf{00}}$ (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 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

1. If $\log_b x = 4$ and $\log_b y = 6$, evaluate $\log_b \dfrac{x^3 y^{1/3}}{y\sqrt{x}}$

    A. 4

    B. 5

    C. 2

    D. 6

    E. 3

2. Evaluate $\sin^{-1}\left(\sin \dfrac{4\pi}{3}\right)$

    A. $\dfrac{2\pi}{3}$

    B. $-\dfrac{\pi}{3}$

    C. $\dfrac{4\pi}{3}$

    D. $-\dfrac{2\pi}{3}$

    E. $\dfrac{\pi}{3}$

3. Find the limit:

$$\lim_{x \to 4} \frac{\frac{2}{x-2} - \frac{1}{x-3}}{x - 4}$$

    A. 1/4

    B. 1/3

    C. 1/2

    D. 1/6

    E. The limit does not exist

4. Find the limit:

$$\lim_{x \to 1} \frac{x - 1}{\sqrt{2x + 23} - 5}$$

    A. $\dfrac{5}{2}$

    B. 5

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

    D. 10

    E. $\dfrac{2}{5}$

5. Find the limit:
$$\lim_{x \to 0} x^2 \cos\left(\frac{2}{x}\right)$$

A. 1

B. 0

C. $-\infty$

D. ∞

E. The limit does not exist, and is neither ∞ nor $-\infty$

6. Find the limit:
$$\lim_{t \to -2^+} \frac{t - 1}{\sqrt{(t+3)(t+2)}}$$

A. ∞

B. -3

C. 3

D. The limit does not exist, and is neither ∞ nor $-\infty$

E. $-\infty$

7. Find the limit:
$$\lim_{t \to 2^-} \frac{|2t - 4|}{t^2 - 4}$$

A. ∞

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

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

D. The limit does not exist, and is neither ∞ nor $-\infty$

E. $-\infty$

8. Suppose $f(x) = \dfrac{2x^3 + 16x^2 + 30x}{x^3 + 5x^2}$. Which of the following statements are correct?

(i) $y = 2$ is a horizontal asymptote.
(ii) $x = -5$ is a vertical asymptote.
(iii) $\lim\limits_{x \to 0} f(x) = \infty$

A. Only statement (i) is correct.

B. Only statements (i) and (ii) are correct.

C. Only statements (i) and (iii) are correct.

D. All three statements are correct.

E. Only statements (ii) and (iii) are correct.

9. Find the value of c such that f is continuous at $x = 2$.

$$f(x) = \begin{cases} \frac{x^2-5x+c}{x-2} & \text{if } x < 2 \\ \tan\left(\frac{3\pi}{2x}\right) & \text{if } x \geq 2 \end{cases}$$

A. $c = 6$

B. Such a c does not exist.

C. $c = 3$

D. $c = -1$

E. $c = 4$

10. Suppose that $f'(a)$ is given by

$$\lim_{h \to 0} \frac{e^h - h - 1}{h}$$

Which of the following is a correct choice for f and a?

A. $f(x) = e^x$ and $a = 0$

B. $f(x) = e^x - x$ and $a = 1$

C. $f(x) = e^x - x$ and $a = 0$

D. $f(x) = e^x - x - 1$ and $a = 1$

E. $f(x) = e^x$ and $a = 1$

11. Suppose that $f(x)$ is the amount of caffeine (in mg) in the bloodstream x hours after 8:00am. Assume that f is differentiable at $x = 1$ and $y = -10x + 80$ is the line tangent to the graph of f at $x = 1$. Which of the following statements might **NOT** be true?

    A. At 9:00am, there are 70 mg of caffeine in the bloodstream.

    B. $\lim\limits_{x \to 1} f(x) = 70$

    C. At 9:00am, the instantaneous rate of caffeine change is -10 mg/hour.

    D. $\lim\limits_{x \to 1} \dfrac{f(x) - f(1)}{x - 1} = -10$

    E. At 8:00am, there are 80 mg of caffeine in the bloodstream.

12. Here is the graph of f:
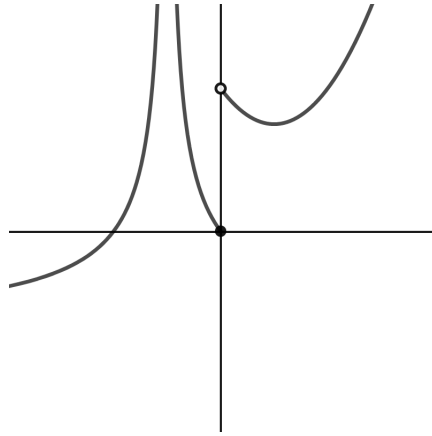
Find the graph of the derivative, f'.

A.

B.

C.

D.

E.