Test Number: 1150

MA 16010 **Exam 1** **Spring 2025**

Student's Name: _____ **Section Number:** _____

(Without your name and section number, we will NOT be able to locate your exam booklet.)

1. Fill out your name and section number in the space provided above. On the scantron, fill in **your name, section number, test number and student ID**. Sign your name.
2. You can write on this exam booklet. Turn in both your scantron and your exam booklet when you are done. Note: **you will be graded ONLY based on your scantron answer sheet**.
3. Only a one-line display scientific calculator is allowed. NO other electronic devices are allowed. No books or notes are allowed.
4. There are 12 questions with 8 points each for a total of 96 points. You will have 60 minutes to complete the exam. Good luck!

Instructor	Time	Section	Instructor	Time	Section
Ashton, Liam	9:30	103	Ashton, Liam	10:30	104
Delgado, Huimei	12:30	700	Delgado, Huimei	online	814
Delworth, Tim	7:30	811			
Devale, Tanmay	8:30	101	Devale, Tanmay	9:30	102
Manning, Amanda	2:30	109	Manning, Amanda	3:30	110
O'Connor, Sam	7:30	105	O'Connor, Sam	8:30	106
Robbins, Jakayla	9:30	813	Robbins, Jakayla	10:30	812
Wan, Hao	10:30	107	Wan, Hao	11:30	108

Problem 1

Find the following limit numerically.

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

x	-0.1	-0.01	-0.001	-0.0001	0	0.0001	0.001	0.01	0.1
$f(x)$									

1. (A) -3

   (B) -1

   (C) 3

   (D) 2

   (E) -2

   (F) 1

Problem 2

Which of the following functions has a hole at $x = 5$?

2. (A) $f(x) = \dfrac{x+5}{x^2-25}$

(B) $f(x) = \dfrac{5}{x+5}$

(C) $f(x) = \dfrac{x^2-25}{x-5}$

(D) $f(x) = \dfrac{5}{x^2-25}$

(E) $f(x) = \dfrac{x-5}{x+5}$

(F) $f(x) = \dfrac{1}{x-5}$

Problem 3

Let

$$f(x) = \begin{cases} 5x, & x < 1 \\ 20 - x, & 1 \leq x < 3 \\ 2x^2 - 1, & x \geq 3 \end{cases}$$

Which statement is true about the discontinuities of $f(x)$?

3. (A) $f(x)$ is only discontinuous at $x = 19$.

(B) $f(x)$ is only discontinuous at $x = 3$.

(C) $f(x)$ is only discontinuous at $x = 1$.

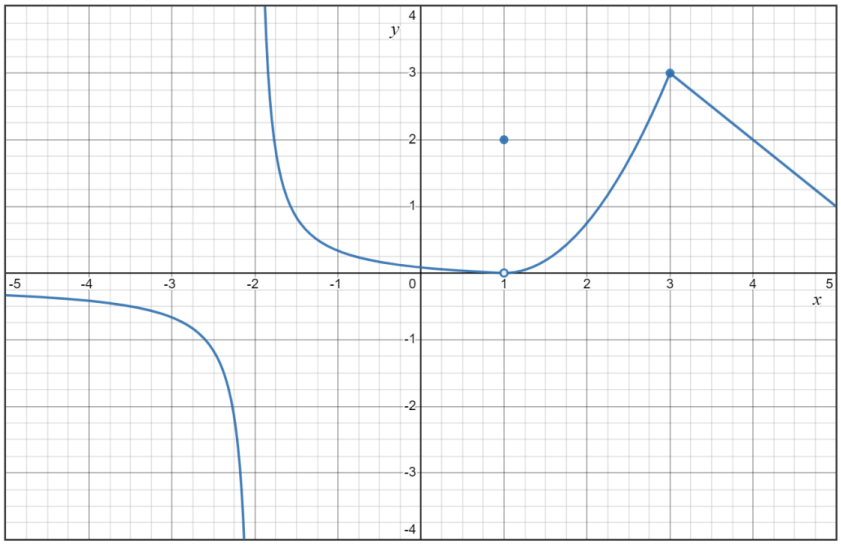
(D) $f(x)$ is only discontinuous at $x = 17$.

(E) $f(x)$ is only discontinuous at $x = 5$.

(F) $f(x)$ does not have any discontinuities.

Problem 4

The graph of $f(x)$ is sketched below. Find $\lim_{x\to -2} f(x)$ and $\lim_{x\to 1} f(x)$.



4. (A) $\lim_{x\to -2} f(x)$ does not exist; $\lim_{x\to 1} f(x) = 0$

(B) $\lim_{x\to -2} f(x) = -\infty$; $\lim_{x\to 1} f(x) = 2$

(C) $\lim_{x\to -2} f(x) = +\infty$; $\lim_{x\to 1} f(x) = 0$

(D) $\lim_{x\to -2} f(x) = -\infty$; $\lim_{x\to 1} f(x) = 0$

(E) $\lim_{x\to -2} f(x)$ does not exist; $\lim_{x\to 1} f(x) = 2$

(F) $\lim_{x\to -2} f(x) = +\infty$; $\lim_{x\to 1} f(x) = 2$

Problem 5

Find the derivative of $y = 6\sqrt{x} - \frac{3}{x^2} - 8\sqrt[4]{x^5}$.

5. (A) $\frac{6}{\sqrt{x}} + \frac{6}{x^3} - 10\sqrt[4]{x}$

(B) $\frac{3}{\sqrt{x}} - \frac{3}{2x} - 10\sqrt[4]{x}$

(C) $\frac{6}{\sqrt{x}} - \frac{3}{2x} - \frac{32}{5\sqrt[4]{x}}$

(D) $\frac{3}{\sqrt{x}} + \frac{6}{x^3} - 10\sqrt[4]{x}$

(E) $\frac{6}{\sqrt{x}} + \frac{6}{x^3} - \frac{32}{5\sqrt[4]{x}}$

(F) $\frac{3}{\sqrt{x}} + \frac{6}{x^3} - \frac{32}{5\sqrt[4]{x}}$

Problem 6

The position of a particle moving in a straight line is given by

$$s(t) = \frac{7}{3}t^3 - 7t^2 - 56t + 10$$

where t is time in seconds and $s\,(t)$ is in feet. At what time is the particle's velocity zero?

6. (A) t=1 second

(B) t=4 seconds

(C) t=6 seconds

(D) t=5 seconds

(E) t=3 seconds

(F) t=2 seconds

Problem 7

We want to find the derivative of $f(x) = \dfrac{1}{5x}$ using the limit definition. In which of the following is the limit definition set up correctly?

7. (A) $$f'(x) = \lim_{h \to 0} \frac{\dfrac{1}{5(x+h)} + \dfrac{1}{5x}}{h}$$

(B) $$f'(x) = \lim_{h \to 0} \frac{\dfrac{1}{5x+h} - \dfrac{1}{5x}}{h}$$

(C) $$f'(x) = \lim_{x \to 0} \frac{\dfrac{1}{5(x+h)} + \dfrac{1}{5x}}{x}$$

(D) $$f'(x) = \lim_{x \to 0} \frac{\dfrac{1}{5x+h} - \dfrac{1}{5x}}{x}$$

(E) $$f'(x) = \lim_{x \to 0} \frac{\dfrac{1}{5(x+h)} - \dfrac{1}{5x}}{x}$$

(F) $$f'(x) = \lim_{h \to 0} \frac{\dfrac{1}{5(x+h)} - \dfrac{1}{5x}}{h}$$

Problem 8

Find the equation of the tangent line to the graph of $y = 2x^3 - 3x$ at $x = 2$.

8. (A) $y = 21x - 52$

(B) $y = 7x + 7$

(C) $y = 7x - 35$

(D) $y = 10x + 1$

(E) $y = 10x - 41$

(F) $y = 21x - 32$

Problem 9

Given $y = 4x\cos x$, find $y'(\frac{\pi}{4})$.

9. (A) $\frac{\sqrt{2}}{2} - 2\pi$

   (B) $2\sqrt{2} - \frac{\sqrt{2}\pi}{2}$

   (C) $\frac{\sqrt{2}}{2} + 2\sqrt{2}\pi$

   (D) $-2\sqrt{2}$

   (E) -2

   (F) $-2\sqrt{2} - 2$

Problem 10

Given $f(x) = \frac{3e^x - 1}{3e^x + 1}$. Find $f'(0)$.

10. (A) $\frac{3}{8}$

    (B) $\frac{1}{2}$

    (C) $-\frac{3}{4}$

    (D) $\frac{1}{8}$

    (E) $-\frac{3}{2}$

    (F) $\frac{1}{4}$

Problem 11

If $h(x) = \tan x - \cot x$,, then $h'(x) =$

11. (A) $\sec^2 x + \csc^2 x$

(B) $\sec x \tan x - \csc x \cot x$

(C) $\sec x \cot x + \csc x \tan x$

(D) $\sec x \cot x - \csc x \tan x$

(E) $\sec x \tan x + \csc x \cot x$

(F) $\sec^2 x - \csc^2 x$

Problem 12

Find $g'(1)$.

$$g(x) = \left(\frac{-x}{x^2 - 2}\right)^3$$

12. (A) 12

(B) 9

(C) 6

(D) 3

(E) 27

(F) 18