Test Number: 1212

MA 16010 **Exam 3** **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

$\lim_{x\to\infty} f(x) = -\infty$ is true for which of the following functions?

1. (A) $f(x) = \dfrac{10-5x}{x}$

   (B) $f(x) = \dfrac{x+18}{-x+6}$

   (C) $f(x) = \dfrac{18-x^2}{9x}$

   (D) $f(x) = \dfrac{-x^3-3x}{2x^4-5x^2}$

   (E) $f(x) = \dfrac{3x^2}{x+2x^2}$

   (F) $f(x) = \dfrac{5x-x^2}{-x+5}$

Problem 2

Find the slant asymptote of $f(x) = \dfrac{-6x^2+7x-8}{-2x+1}$.

2. (A) $y = 4x+5$

   (B) $y = -6x-1$

   (C) $y = 3x-2$

   (D) $y = -4x-5$

   (E) $y = -3x+2$

   (F) $y = 6x+1$

Problem 3

Compute the sum

$$\sum_{i=1}^{4}(i^2+3)$$

3. (A) 34

   (B) 39

   (C) 49

   (D) 31

   (E) 42

   (F) 45

Problem 4

$\int(\sin x - \csc^2 x)\,\mathrm{d}x =$

4. (A) $-\cos x + \csc x + C$

   (B) $-\cos x + \cot x + C$

   (C) $-\cos x + \tan x + C$

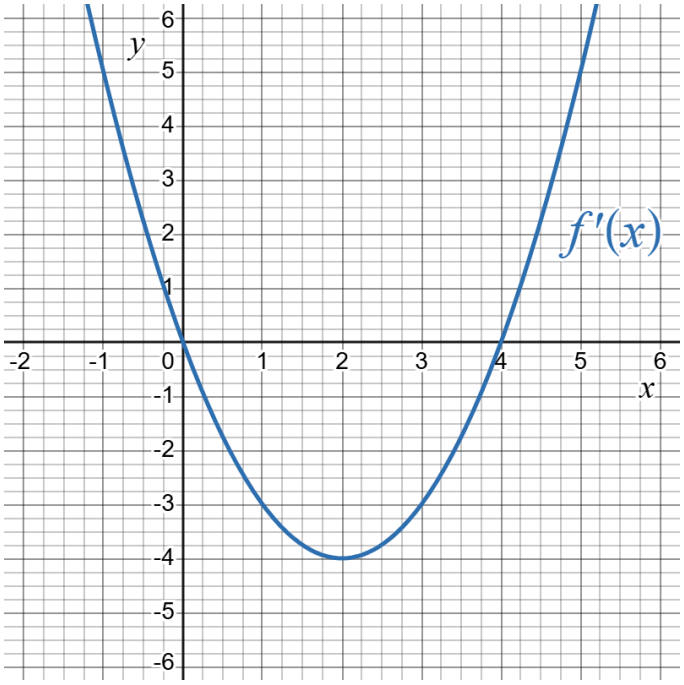
   (D) $\cos x - \tan x + C$

   (E) $\cos x - \csc x + C$

   (F) $\cos x + \cot x + C$

Problem 5

The graph of the **derivative** of $f(x)$ is shown below. Choose the correct statement regarding $f(x)$.



5. (A) $f(x)$ has only one critical number which is $x = -4$.

   (B) $f(x)$ has two critical numbers which are $x = 0$ and $x = 4$.

   (C) $f(x)$ has only one critical number which is $x = 4$.

   (D) $f(x)$ has only one critical number which is $x = 0$.

   (E) $f(x)$ has two critical numbers which are $x = 2$ and $x = -4$.

   (F) $f(x)$ has only one critical number which is $x = 2$.

Problem 6

Evaluate

$$\int \frac{2\sqrt{x}+6x^3+3}{x}\,\mathrm{d}x$$

6. (A) $4\sqrt{x}+2x^3+3\ln|x|+C$

(B) $4\sqrt{x}+12x+3\ln|x|+C$

(C) $2\sqrt{x}+12x-\frac{3}{x^2}+C$

(D) $2\sqrt{x}+2x^3+3\ln|x|+C$

(E) $2\sqrt{x}+2x^3-\frac{3}{x^2}+C$

(F) $4\sqrt{x}+2x^3-\frac{3}{x^2}+C$

Problem 7

A family wants to fence a rectangular play area alongside the wall of their house. The wall of their house bounds one side of the play area. If they want the play area to be exactly 2500 ft^2, what is the least amount of fencing needed? Round your answer to the nearest tenth place.

7. (A) 212.1 ft

(B) 70.7 ft

(C) 186.6 ft

(D) 106.1 ft

(E) 93.3 ft

(F) 141.4 ft

Problem 8

Consider the function:

$$f(x) = \frac{x^2 + 2x + 1}{2x - 8}$$

Consider the following statements:

I. $f(x)$ does not have a horizontal asymptote.

II. $f(x)$ has a vertical asymptote.

III. $f(x)$ has a slant asymptote.

IV. The x-intercept of $f(x)$ is $(-1,0)$.

Which of these statements are **TRUE**?

8. (A) II and III only

(B) I and II only

(C) II, III and IV only

(D) I and IV only

(E) I, III and IV only

(F) All of them

Problem 9

The rate of growth of a population of bacteria, $\frac{\mathrm{d}P}{\mathrm{d}t}$, is given by

$$\frac{\mathrm{d}P}{\mathrm{d}t} = 6t,$$

where P is the population size and t is the time in days. The initial size of the population is 2000. What is the population after 50 days?

9. (A) 5725

   (B) 8625

   (C) 2300

   (D) 7500

   (E) 17000

   (F) 9500

Problem 10

Find the maximum possible volume of a right circular cylinder with surface area of 6π ft^2.

(If a right circular cylinder has radius r and height h, its volume is $\pi r^2 h$ and its surface area is $2\pi r^2 + 2\pi r h$.)

10. (A) 2π ft^3

    (B) 4π ft^3

    (C) 5π ft^3

    (D) 6π ft^3

    (E) π ft^3

    (F) 3π ft^3

Problem 11

Find the right Riemann sum that approximates the area under the curve of $y = \sqrt{x+5}$ on the interval $[2,12]$ with 100 rectangles. Give the answer in sigma notation.

11. (A) $\sum_{i=0}^{99} \frac{1}{10}\sqrt{5+\frac{1}{10}i}$

(B) $\sum_{i=1}^{100} \frac{1}{10}\sqrt{7+\frac{1}{10}i}$

(C) $\sum_{i=1}^{100} \frac{1}{10}\sqrt{5+\frac{1}{10}i}$

(D) $\sum_{i=0}^{100} \frac{1}{10}\sqrt{5+\frac{1}{10}i}$

(E) $\sum_{i=0}^{100} \frac{1}{10}\sqrt{7+\frac{1}{10}i}$

(F) $\sum_{i=0}^{99} \frac{1}{10}\sqrt{7+\frac{1}{10}i}$

Problem 12

Find the x coordinate of the point on the graph of $y = 5x - 1$ that is the closest to the point $(-1,2)$.

12. (A) $\frac{1}{5}$

(B) $\frac{7}{13}$

(C) $\frac{8}{13}$

(D) $\frac{1}{3}$

(E) $\frac{2}{5}$

(F) $\frac{2}{3}$