

CALCULUS (Global Governance) A.Y. 2025-26

Prof. Rafael L. Greenblatt & Alfonso Sorrentino

FIRST MIDTERM TEST: 29st OCTOBER 2025

Last Name:	First Name:	Student's ID:
------------	-------------	---------------

Instructions:

- You have 2 hours to answer the following questions. Report your answers in the table provided below.
- No notes, books, or any other reference materials is allowed during the test.
- Electronic devices, including computers, tablets, and cell phones, are strictly prohibited. You are only permitted to use a non-scientific and non-graphing calculator.

Answers

1	2	3	4	5	6	7

Questions

1. Where is the function

$$\ell(x) = \frac{1}{6}(x^3 - 12x^2 - 42x) + 7(x+4)\ln(x+4)$$

increasing least rapidly in $(0, +\infty)$?

- (a) In the limit as x goes to $+\infty$
- (b) $x = 2$
- (c) $x = 4$
- (d) $x = 3$
- (e) $x = 7$

2. The level of radiation in a contaminated area decreases over time. After t hours, the radiation level $R(t)$ in millisieverts (mSv) is given by $R(t) = 0.1(1 + 2e^{-0.04t})$. How long (in hours) will it take for the radiation level to reach 0.2 mSv?

- (a) $\frac{5}{2}\ln(4)$
- (b) $\frac{25}{2}\ln(3)$
- (c) $5\ln(20) - \frac{1}{2}$
- (d) $25\ln(2)$
- (e) It will never reach this concentration.

3. Determine where $h(x) := x^5\sqrt{5x - x^2}$ is increasing:

- (a) $(-\infty, 0) \cup (\frac{55}{12}, +\infty)$
- (b) $(0, \frac{55}{12})$
- (c) $(\frac{55}{12}, 5)$
- (d) $(-\infty, 0) \cup (5, +\infty)$
- (e) Never

4. Determine the domain of the function

$$f(x) := \sqrt{\frac{e^{-10x} + 7}{10x - 3x^2 - x^3}}$$

- (a) $\mathbb{R}$
- (b) $(-\infty, -5] \cup [0, 2]$
- (c) $(-\infty, -5) \cup (0, 2)$
- (d) $[-5, 0] \cup [2, +\infty)$
- (e) $(-5, 0) \cup (2, +\infty)$

5. Determine the oblique or horizontal asymptote at $-\infty$ of the function

$$k(x) = \frac{3x^7 + 3x^6 - 3x^2}{x^6 - 6x^5 + 3}$$

- (a) Horizontal asymptote $y = -3$
- (b) Oblique asymptote $y = -3x$
- (c) Oblique asymptote $y = 3x + 21$
- (d) Neither of the two exists
- (e) Horizontal asymptote $y = 3$

6. Compute the following limit

$$\lim_{x \rightarrow -\infty} \frac{6x^6 + x^5 - 5x + 12}{6x^5 - 18x^4 + 6} =$$

- (a) 1
- (b) $+\infty$
- (c) -1
- (d) 0
- (e) $-\infty$

7. Compute the following limit

$$\lim_{x \rightarrow 1} \left(\frac{3 \ln(3x^2 - 5x + 3)}{5x - 5} \right) =$$

- (a) $\frac{2}{5}$
- (b) $+\infty$
- (c) 0
- (d) It does not exist
- (e) $\frac{3}{5}$