Name: _____ **Enrolment No.** _____

AHMEDABAD UNIVERSITY
SCHOOL OF ARTS AND SCIENCES

UNDERGRADUATE PROGRAMME

2025–2026 MONSOON SEMESTER
END SEMESTER EXAMINATION

MAT123 PRECALCULUS

SET B

Date: 22-02-2026 **Total Marks:** 50
Time: 11.00 am – 01.00 pm **No. of Printed Pages:** 5

General Instructions

1. Students must carry their identity card during the examination.
2. No break is allowed during the examination under any circumstances. In case of an emergency, with prior permission of the invigilator and an escort, a break of maximum five minutes is allowed.
3. No unauthorized devices, such as mobile phones, any kind of watches, other gadgets, or any kind of material is allowed on person.
4. Any violation of examination rules and an intent of malpractice will lead to strict disciplinary action, including a possible expulsion from the university.

Course-specific Instructions

1. **Write your name of the set of the question paper on your answer sheet. FAILURE TO DO THIS MAY LEAD TO A ZERO MARKS IN END TERM**
2. Read the question paper (including all instructions) thoroughly before starting.
3. **Part 1:** It consists of objective-type questions with negative marking. Only one option is correct.
4. **Part 2:** It consists of MCQs with multiple correct choices.
   - To score the full point you **must select *all* correct options**.
   - **No partial credit** will be given for partially correct selections.
   - **YOU NEED TO SELECT ALL CORRECT ANSWERS.**
5. **Part 3:** It consists of subjective / explanation-based problems.
   - In Parts 1 and 2, there is no need to show rough work.
   - In Part 3, you **must** write mathematically correct statements and show all steps.

1 Objective type questions (6 questions of 2 marks each. For every correct answer, you get 2 marks and -0.5 marks for each incorrect answer)

1. What is the asymptote of the function $f(x) = (1.0001)^{x-1.0001}$?
   A. $y = 1$
   B. $y = 1.0001$
   C. $y = 0$
   D. $x = 0$.

2. Let $g : \mathbb{R} \to \mathbb{R}$ be defined by $g(x) = x^2$. The function g is
   A. one-one but not onto
   B. onto but not one-one
   C. bijective
   D. neither one-one nor onto

3. What is the domain of the function $f(x) = \ln(x^2 + 1)$?
   A. $(-\infty, -1)$
   B. $(-\infty, -1] \cup [1, \infty)$
   C. $(1, \infty)$
   D. $(-\infty, \infty)$

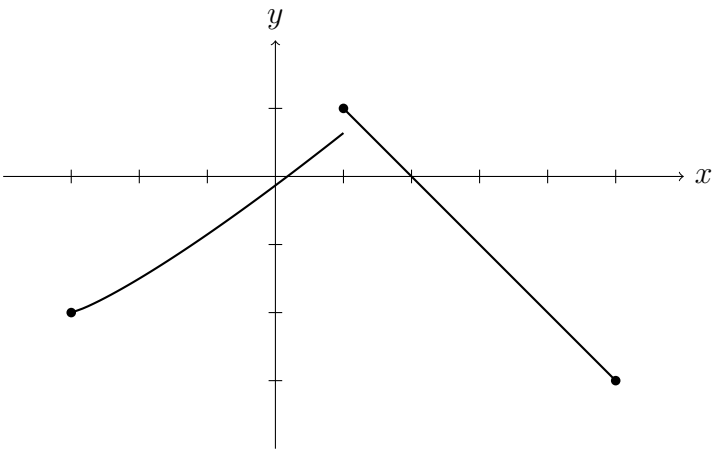
4. Solution of the following system of linear equation

$$5x + 2y = 3$$
$$2x + y = 4$$

   is
   A. $(-10, 28)$
   B. $(-5, 14)$
   C. $(2, 0)$
   D. $(0, 4)$

5. The quadratic equation $x^2 - 6x + 10 = 0$ has
   A. two distinct real roots
   B. one real root
   C. two complex conjugate roots
   D. rational roots

6. Graph of $f(x)$



A. Domain $= (-3, 5]$, Range $= [-3, 4]$

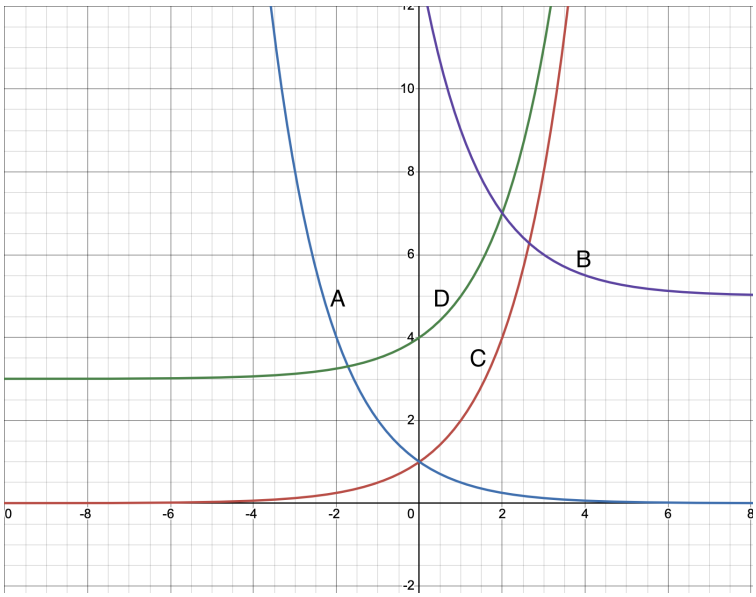
B. Domain $= [-3, 5]$, Range $= (-3, 4)$

C. Domain $= [-3, 5]$, Range $[-3, 1]$

D. Domain $= [-3, 1) \cup [1, 5]$, Range $= [-2, 4)$

2 Multiple options correct type questions. (6 questions of 3 marks each. Each question may have more than one correct option. Mark all the correct option to get the full 3 marks. No partial marks for not answering all the correct options.)

1. Carefully study the graphs of an exponential family of functions and choose the correct options.



1. $f(x) = 2^x$
2. $g(x) = 2^x + 3$
3. $h(x) = 2^{-x}$
4. $k(x) = 2^{(-x+3)} + 5$

A. The correct matchings are $(f(x), B)$, $(g(x), A)$, $(h(x), C)$ and $(k(x), D)$.

B. The correct matchings are $(f(x), C)$, $(g(x), D)$, $(h(x), A)$ and $(k(x), B)$.

C. The correct matchings are $(f(x), D)$, $(g(x), C)$, $(h(x), B)$ and $(k(x), A)$.

D. The correct matchings are $(f(x), C)$, $(g(x), B)$, $(h(x), A)$ and $(k(x), D)$.

2. Let $f : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = x^3$. Which of the following statements are true?

A. f is one-one.

B. f is onto.

C. f is bijective.

D. f has a maximum value.

3. For the quadratic equation $x^2 - 5x + 6 = 0$, which of the following are true?

A. The roots are real.

B. The roots are integers.

C. The sum of roots is 5.

D. The product of roots is 6.

4. Which of the following expressions are equivalent to $\log_2(16x^2)$?

A. $4 + 2\log_2(x)$

B. $8\log_2(2x)$

C. $\log_2(4^2) + \log_2(x^2)$

D. $4 + \frac{2}{\log_x 2}$

5. The following system of equations

$$y = |x - 2|$$
$$y = |x - 3|$$

A. has solutions for $2 < x < 3$

B. has no solutions for $x > 3$

C. has solutions for $x < 2$

D. has solutions for $x > 1$

6. Find the domain of the function

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

A. Domain $= \mathbb{R} \setminus \{-1, 1\}$

B. Domain $= \mathbb{R}^+$

C. Domain $= \mathbb{R}$

D. Domain $= \mathbb{R}^-$

3 Subjective type questions. Show all steps to get full marks (every question carries 4 marks). *Do any five out of the following eight questions*

1. The product of two consecutive positive integers is 156. Find the integers.

2. Solve for x: $2^x + 4^x = 72$.

   Hint: Look for a way to express the equation so that it involves only one exponential expression. After doing so, consider whether the resulting equation resembles a polynomial-type equation that you already know how to solve.

3. Solve for x: $\log(x^2) + \log(x^2 - 3) = 1$.

4. Solve the following system of non-linear equation

$$x^4 - 3x^2 = y$$
$$y = 10$$

5. Let $f : \mathbb{R} \to \mathbb{R}$ be defined by
$$f(x) = 2x^3 - 5.$$
   (a) Show that f is one-one.
   Hint: Assume $f(a) = f(b)$ and try to show that $a = b$.
   (b) Show that f is onto.
   Hint: Start with an arbitrary $y \in \mathbb{R}$ and solve the equation $f(x) = y$ for x.
   (c) Hence determine whether f is bijective.
   Hint: Recall that a function has an inverse if and only if it is bijective.
   (d) If the inverse function exists, find $f^{-1}(x)$.

6. Find all real solutions of the equation
$$\sqrt{x+4} + \sqrt{9-x} = \sqrt{13}.$$

7. If $x - \frac{1}{x} = 6$, find the value of $x^3 - \frac{1}{x^3}$.

8. Let
$$f(x) = \sqrt{x-1}, \qquad g(x) = \frac{1}{x-2}.$$
   Find the domain of $(g \circ f)(x)$.