Sino Bright School Chongqing

Monthly Exam, 2025-2026 T1

Subject:	Pure Mathematics 1
Date:	Oct 2025
Time:	90 Minutes
Teacher:	Shi Feng

IMPORTANT: Read together before beginning the exam.

Students must complete the assessments to the best of their ability. Any students found cheating during an exam will be given a zero and referred to the Principal for further disciplinary measures. Cheating is a serious offense.

"Cheating" may include any of the following:

- Having course papers, notes, unapproved data sheets or other course-related materials in the exam room without the expressed permission of the subject class teacher in charge of the exam.
- Using or even having a cellphone or other electronic device in the exam room without the express permission of the subject class teacher in charge of the exam.
- Attempting to communicate, either verbally or non-verbally with other students during the exam.
- Having exam-related materials prior to the writing of the exam.

Mark Breakdown:	Student Name:
Part I: Multiple Choice Questions $5pts \times 10$ Part II: Short Answer Questions $5pts \times 4$ Part III: Long Answer Questions $30pts$	
Total Score: 100	Score: _____

Special Instructions/Materials Allowed:

- Pen

Part I: Multiple Choice Questions (20 marks)

Choose the correct answer for each question. Each question carries 2 marks.

1. Which expression is equivalent to $(3x^2y^{-3})^2$?

   (a) $6x^4y^{-6}$ (b) $9x^4y^{-6}$ (c) $9x^4y^{-5}$ (d) $6x^4y^{-5}$

2. The discriminant of $x^2 - 4x + k = 0$ is 0. What is the value of k?

   (a) 2 (b) 4 (c) 6 (d) 8

3. Which inequality represents the solution set for $x^2 - 5x - 14 > 0$?

   (a) $x < -2$ or $x > 7$ (b) $x < -7$ or $x > 2$ (c) $-2 < x < 7$ (d) $-7 < x < 2$

4. The graph of $y = \frac{1}{x}$ is translated by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$. What is the equation of the new graph?

   (a) $y = \frac{1}{x-2} - 3$ (b) $y = \frac{1}{x+2} + 3$ (c) $y = \frac{1}{x-2} + 3$ (d) $y = \frac{1}{x+2} - 3$

5. Which of the following is a factor of $x^3 - 4x$?

   (a) $x - 2$ (b) $x + 1$ (c) $x^2 + 4$ (d) $x - 4$

6. Simplify $\sqrt{12} + \sqrt{27}$.

   (a) $5\sqrt{3}$ (b) $6\sqrt{3}$ (c) $7\sqrt{3}$ (d) $8\sqrt{3}$

7. What is the value of $8^{-\frac{2}{3}}$?

   (a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) 2 (d) 4

8. The function $f(x) = x^2 + 2x + 3$ has:

   (a) Two distinct real roots (b) One repeated real root (c) No real roots (d) A minimum point at $(-1, 2)$

9. Which of the following is the completed square form of $x^2 + 8x + 1$?

   (a) $(x + 4)^2 - 15$ (b) $(x + 4)^2 + 15$ (c) $(x + 8)^2 - 63$ (d) $(x + 8)^2 + 1$

10. The solutions to the equation $x^2 - 6x + 9 = 0$ are:

    (a) $x = 3$ only (b) $x = -3$ only (c) $x = 3$ and $x = -3$ (d) No real solutions

Part II: True/False Questions (10 marks)

State whether each statement is True or False. Each question carries 2 marks.

1. **True/False:** The function $f(x) = x^2 + 2x + 3$ has no real roots.
2. **True/False:** The graph of $y = (x - 2)^2 + 3$ has a minimum point at $(2, 3)$.
3. **True/False:** The expression $\sqrt{12} + \sqrt{27}$ simplifies to $5\sqrt{3}$.
4. **True/False:** The inequality $\frac{1}{x} > 2$ holds for all $x > 0$.
5. **True/False:** The simultaneous equations $y = x^2$ and $y = 2x - 1$ have exactly one solution.

Section C: Short Answer Questions (20 marks)

Complete the following statements. Each blank carries 2 marks.

1. The simplified form of $\frac{6x^3y^2}{2xy}$ is _____.
2. The solutions to $x^2 - 6x + 9 = 0$ are _____.
3. The completed square form of $x^2 + 8x + 1$ is _____.
4. The values of x for which $\frac{x+1}{x-2} < 0$ are _____.
5. The asymptotes of $y = \frac{3}{x-4} + 2$ are _____ and _____.
6. The discriminant of $3x^2 - 2x + 5 = 0$ is _____.
7. The roots of $2x^2 + 5x - 3 = 0$ are _____ and _____.
8. The inequality $x^2 + 4x + 4 \geq 0$ holds for _____.
9. The translation vector that maps $y = x^2$ to $y = (x + 3)^2 - 5$ is _____.
10. The solution set for $|2x - 1| = 5$ is _____.

Section D: Long Questions (40 marks)

Show all steps clearly. Each question carries 10 marks.

1. (a) Solve the equation $x^2 - 10x + 16 = 0$ by factorisation.
   (b) Hence, solve the inequality $x^2 - 10x + 16 \leq 0$.
   (c) Sketch the graph of $y = x^2 - 10x + 16$, indicating key points.
2. (a) Simplify $\frac{2x^2-8}{x^2-4x+4}$.
   (b) Express $\frac{3}{\sqrt{5}-1}$ in the form $a + b\sqrt{5}$, where a and b are rational.
   (c) Factorise completely: $x^3 - 3x^2 - 4x + 12$.

3. (a) Sketch the graph of $y = x^2 - 4x + 3$, labeling intercepts and the turning point.
   (b) On the same axes, sketch the graph of $y = x(x-1)(x+1)$, labeling intercepts.
   (c) What is the vector that translates $y = x^2$ to $y = (x-1)^2 + 2$?

4. (a) Sketch the graphs of the following functions, labeling X and Y intercepts:

$$\begin{cases} f(x) = (2+x)^2(2-x) \\ g(x) = \frac{-4}{x^2} \end{cases}$$

   (b) State, with reason, the number of solutions to the equation $f(x) = g(x)$.
   (c) Using the sketch in part (a), shade the region that satisfies the inequalities $y \geq f(x)$ and $y \leq g(x)$.