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 2 Marks $\times$ 15 Part II: Short Answer Questions 2 Marks $\times$ 15 Part III: Long Answer Questions 40 Marks	
Total Score: 100	Score: _____

Special Instructions/Materials Allowed:

- Pen

Part I: Multiple Choice Questions (30 marks)

Choose the correct answer. Each question carries 2 marks.

1. Simplify $(3x^2y^{-3})^2$:

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

2. Find the value of k if $x^2 - 4x + k = 0$ has discriminant 0:

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

3. Solve $x^2 - 5x - 14 > 0$:

   (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 $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$. What is the new equation?

   (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 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. Evaluate $8^{-\frac{2}{3}}$:

   (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 maximum point at $(-1, 2)$

9. Complete the square: $x^2 + 8x + 1$

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

10. Solve $x^2 - 6x + 9 = 0$:

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

11. Simplify $\frac{\sqrt{50}+\sqrt{18}}{\sqrt{2}}$:

(a) 4 (b) $4\sqrt{2}$ (c) 8 (d) $2\sqrt{2}$

12. Evaluate $27^{-\frac{2}{3}}$:

(a) 9 (b) $\frac{1}{9}$ (c) $\frac{1}{3}$ (d) 3

13. Rationalize: $\frac{-3}{2+\sqrt{5}}$

(a) $6+3\sqrt{5}$ (b) $2-\sqrt{5}$ (c) $6-3\sqrt{5}$ (d) $\frac{3\sqrt{5}-6}{3}$

14. Complete the square: x^2+6x+5

(a) $(x+3)^2-4$ (b) $(x+3)^2+4$ (c) $(x+6)^2-31$ (d) $(x+6)^2+5$

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

(a) $y=(x-2)^2+3$ (b) $y=(x+2)^2+3$ (c) $y=(x-2)^2-3$ (d) $y=(x+2)^2-3$

Part II: Short Answer Questions (30 marks)

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:** $\sqrt{12}+\sqrt{27}=5\sqrt{3}$.
4. **True/False:** The inequality $\frac{1}{x}>2$ holds for all $x>0$.
5. **True/False:** The equations $y=x^2$ and $y=2x-1$ have exactly one solution.

Fill in the Blanks (20 marks)

Complete each statement. Each blank carries 2 marks.

1. Simplify $\frac{6x^3y^2}{2xy}$: _____
2. Solve $x^2-6x+9=0$: _____
3. Complete the square: $x^2+8x+1=$ _____
4. Solve $\frac{x+1}{x-2}<0$: _____
5. Asymptotes of $y=\frac{3}{x-4}+2$: _____ and _____
6. Discriminant of $3x^2-2x+5=0$: _____

7. Roots of $2x^2 + 5x - 3 = 0$: _____ and _____

8. The inequality $x^2 + 4x + 4 \geq 0$ holds for _____

9. Translation vector mapping $y = x^2$ to $y = (x + 3)^2 - 5$: _____

10. For $f(x) = (2x - 3)(x + 1)$, find $f(2x)$: _____

Part III: Long Answer Questions (40 marks)

Show all working. Each question carries 10 marks.

1. **Quadratic Equations and Inequalities**

   (a) Solve $x^2 - 10x + 16 = 0$ by factorisation. (3 marks)

   (b) Hence, solve $x^2 - 10x + 16 \leq 0$. (3 marks)

   (c) Sketch the graph of $y = x^2 - 10x + 16$, indicating key points. (4 marks)

2. **Algebraic Manipulation**

   (a) Simplify $\frac{2x^2 - 8}{x^2 - 4x + 4}$. (3 marks)

   (b) Express $\frac{3}{\sqrt{5} - 1}$ in the form $a + b\sqrt{5}$, where a, b are rational. (3 marks)

   (c) Factorise completely: $x^3 - 3x^2 - 4x + 12$. (4 marks)

3. **Graphs and Transformations**

   (a) Sketch $y = x^2 - 4x + 3$, labeling intercepts and turning point. (4 marks)

   (b) On the same axes, sketch $y = x(x-1)(x+1)$, labeling intercepts. (3 marks)

   (c) Find the translation vector mapping $y = x^2$ to $y = (x-1)^2 + 2$. (3 marks)

4. **Advanced Problems**

   (a) Sketch these functions, labeling intercepts: (4 marks)

$$f(x) = (2+x)^2(2-x), \quad g(x) = \frac{-4}{x^2}$$

   (b) State the number of solutions to $f(x) = g(x)$ and explain why. (3 marks)

   (c) Shade the region satisfying $y \geq f(x)$ and $y \leq g(x)$. (3 marks)