Sino Bright School Chongqing

Midterm Exam, 2025-2026 T1

Class & Subject:	G10 C1 Math
Date:	Nov 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:	
Part I: Multiple Choice Questions ×	Student Name:
Part II: Short Answer Questions ×	
Part III: Long Answer Questions 73 Marks	
Total Marks: 73 Marks	Score: _____

Special Instructions/Materials Allowed:

- Pen, Calculator

Questions

1. (a) Given that $3^{-1.5} = a\sqrt{3}$ find the exact value of a. **(2 marks)**

   (b) Simplify fully $\frac{(2x^2)^3}{4x^2}$. **(2 marks)**

   (Total for question = 5 marks)

2. In this question you must show all stages of your working. Solutions relying entirely on calculator technology are not acceptable.

   The curve C has equation

   $$y = \frac{2}{x} - k$$

   where k is a positive constant.

   (a) Sketch the graph of C.
   Show on your sketch
   - the coordinates of any points of intersection of C with the coordinate axes
   - the equation of the horizontal asymptote to C
   stating each in terms of k. **(3 marks)**
   The line l has equation $y = -kx - 6$

   (b) Given that l intersects C at 2 distinct points, find the range of possible values of k. **(5 marks)**

   (Total for question = 8 marks)

3. The equation

   $$\frac{3}{x} + 5 = -2x + c$$

   where c is a constant, has no real roots.
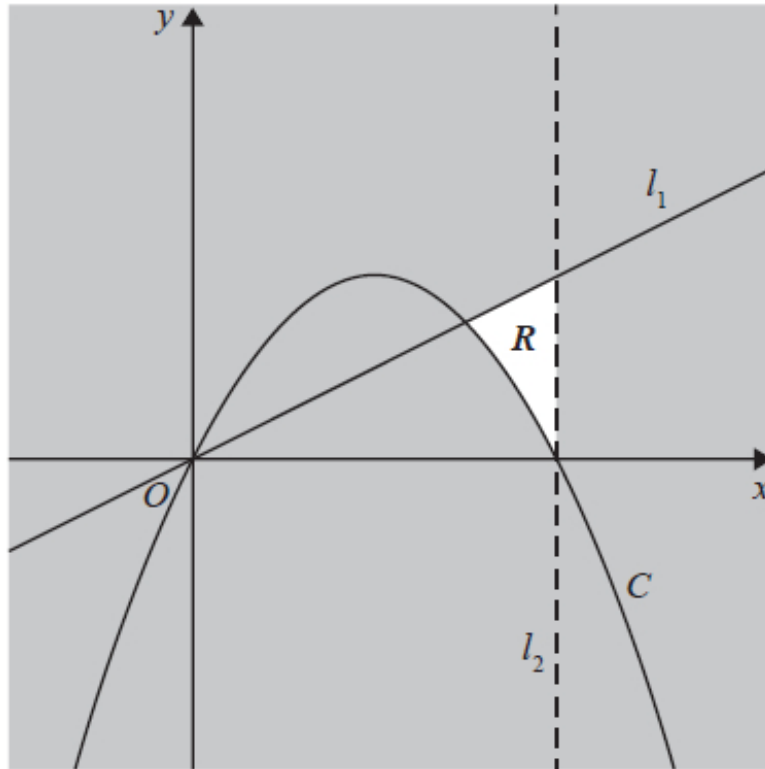   Find the range of possible values of c. **(7 marks)**

Figure 1

4. Figure 1 shows a line l_1 with equation $2y = x$ and a curve C with equation

$$y = 2x - \frac{1}{8}x^2$$

The region R, shown unshaded in Figure 1, is bounded by the line l_1, the curve C and a line l_2. Given that l_2 is parallel to the y-axis and passes through the intercept of C with the positive x-axis, identify the inequalities that define R. **(3 marks)**

5. (a) On the same axes, sketch the graphs of $y = x + 2$ and $y = x^2 - x - 6$ showing the coordinates of all points at which each graph crosses the coordinate axes. **(4 marks)**

   (b) On your sketch, show, by shading, the region R defined by the inequalities

$$y < x + 2 \text{ and } y > x^2 - x - 6$$

(1 marks)

(c) Hence, or otherwise, find the set of values of x for which $x^2 - 2x - 8 < 0$ **(3 marks)**

(Total for question = 8 marks)

6. Solve the simultaneous equations

$$y + 4x + 1 = 0$$
$$y^2 + 5x^2 + 2x = 0$$

(6 marks)

7. A curve has equation

$$y = \frac{x^3}{6} + 4\sqrt{x} - 15 \quad x \geqslant 0$$

(a) Find $\frac{dy}{dx}$, giving the answer in simplest form. **(3 marks)**

(b) The point $P\left(4, \frac{11}{3}\right)$ lies on the curve. Find the equation of the normal to the curve at P. Write your answer in the form $ax + by + c = 0$, where a, b and c are integers to be found. **(4 marks)**
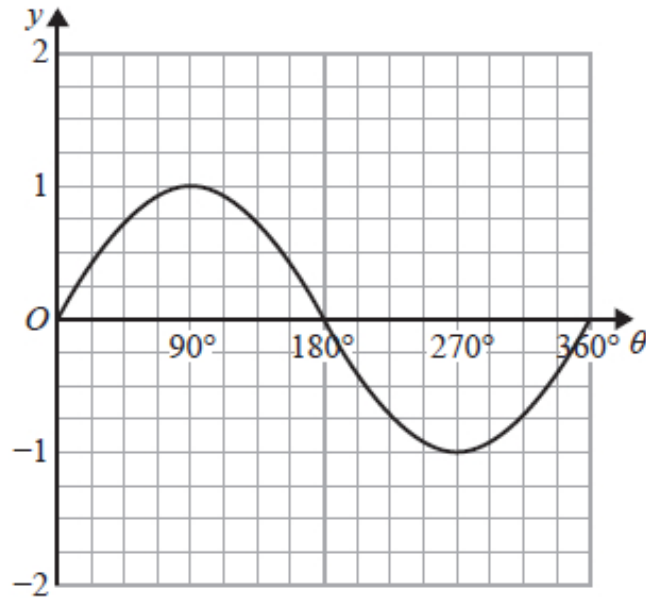
(Total for question = 7 marks)

Figure 2

8. Figure 2 shows a plot of the curve with equation $y = \sin\theta$, $0 \le \theta \le 360°$

(a) State the coordinates of the minimum point on the curve with equation

$$y = 4\sin\theta, \quad 0 \le \theta \le 360°$$

(b) A copy of Figure 3, called Diagram 1, is shown here.
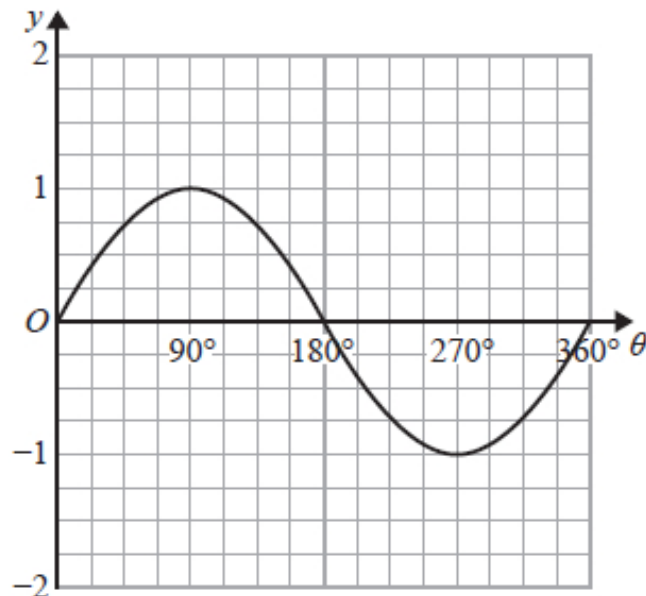On Diagram 1, sketch and label the curves

Diagram 1

    i. $y = 1 + \sin\theta, \quad 0 \le \theta \le 360°$ **(1 marks)**

    ii. $y = \tan\theta, \quad 0 \le \theta \le 360°$ **(1 marks)**

(c) Hence find the number of solutions of the equation

i. $\tan\theta = 1 + \sin\theta$ that lie in the region $0 \le \theta \le 2160°$ **(1.5 marks)**

ii. $\tan\theta = 1 + \sin\theta$ that lie in the region $0 \le \theta \le 1980°$ **(1.5 marks)**

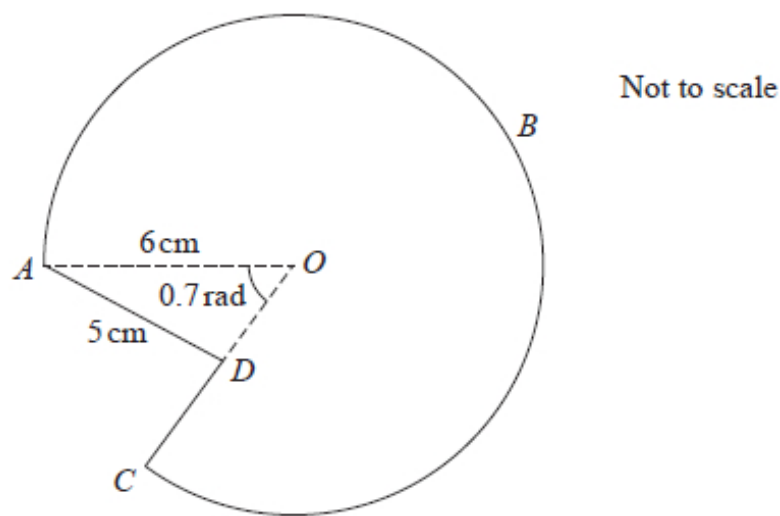**(Total for question = 7 marks)**

Figure 3

9. The shape ABCDA consists of a sector ABCOA of a circle, centre O, joined to a triangle AOD, as shown in Figure 3.

The point D lies on OC.

The radius of the circle is 6 *cm*, length AD is 5 *cm* and angle AOD is 0.7 radians.

(a) Find the area of the sector ABCOA, giving your answer to one decimal place. **(3 marks)**

(b) Given angle ADO is obtuse, find the size of angle ADO, giving your answer to 3 decimal places. **(3 marks)**

(c) Hence find the perimeter of shape ABCDA, giving your answer to one decimal place. **(4 marks)**

(Total for question = 10 marks)

10. (a) On Diagram 2 sketch the graphs of

    i. $y = x(3 - x)$ **(2 marks)**

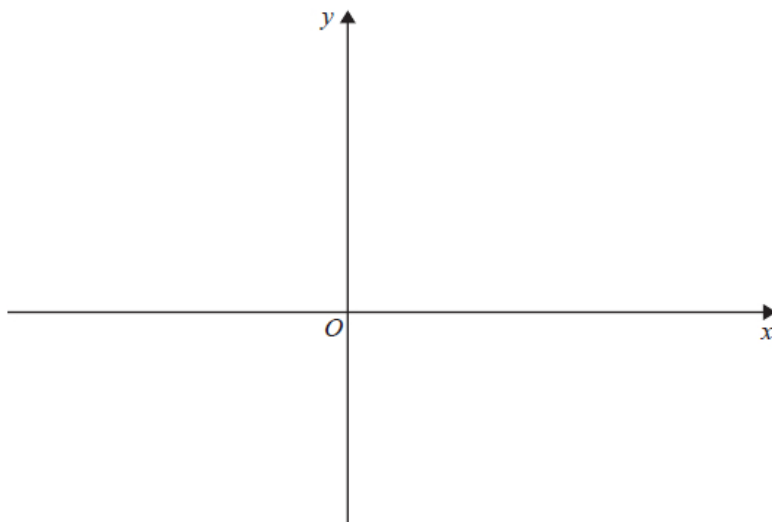   ii. $y = x(x - 2)(5 - x)$ **(2 marks)**

Diagram 2

showing clearly the coordinates of the points where the curves cross the coordinate axes.

(b) Show that the x coordinates of the points of intersection of

$$y = x(3 - x) \text{ and } y = x(x - 2)(5 - x)$$

are given by the solutions to the equation $x(x^2 - 8x + 13) = 0$ **(3 marks)**

(c) The point P lies on both curves. Given that P lies in the first quadrant, find, using algebra and showing your working, the exact coordinates of P.   **(5 marks)**

(Total for question = 12 marks)