



GCE AS/A LEVEL

2300U10-1

WEDNESDAY, 14 MAY 2025 – MORNING

MATHEMATICS – AS unit 1

PURE MATHEMATICS A

**2 hours 30 minutes plus your additional
time allowance**

Surname _____

First name(s) _____

Centre Number _____

Candidate Number 2 _____

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	5	
2	11	
3	6	
4	10	
5	6	
6	16	
7	6	
8	10	
9	5	
10	6	
11	9	
12	4	
13	4	
14	4	
15	11	
16	7	
Total	120	

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- **a Formula Booklet;**
- **a calculator.**

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces provided on the front cover.

(Turn over)

Answer ALL questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The maximum mark for this paper is 120.

The number of marks is given in brackets at the end of each question or part-question.

Sufficient working must be shown to demonstrate the MATHEMATICAL method employed.

(Turn over)

4

Answers without working may not gain full credit.

Unless the degree of accuracy is stated in the question, answers should be rounded appropriately.

You are reminded of the necessity for good English and orderly presentation in your answers.

(Turn over)

REMINDER: Sufficient working must be shown to demonstrate the MATHEMATICAL method employed.

1. Solve the inequality

$$(x - 1)(x + 6) < 9 - 2x - x^2$$

[5 marks]

(Turn over)

6

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2. The line L_1 passes through the points

$A(-2, 0)$ and $B(3, 5)$

(a) Find the equation of L_1 [3 marks]

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2. The line L_2 is perpendicular to L_1
passes through B and intersects
the x -axis at the point C
- (b) Find the coordinates of C
- [3 marks]

[illegible]

12

(Turn over)

2 (c) Show that ABC is an isosceles triangle and calculate its area.

[5 marks]

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(Turn over)

3. Showing all your working, simplify the following expressions.

(a)
$$\frac{(a^2)^4 (\sqrt{a})^{-\frac{8}{3}}}{a^{-\frac{1}{3}}}$$

[3 marks]

(Turn over)

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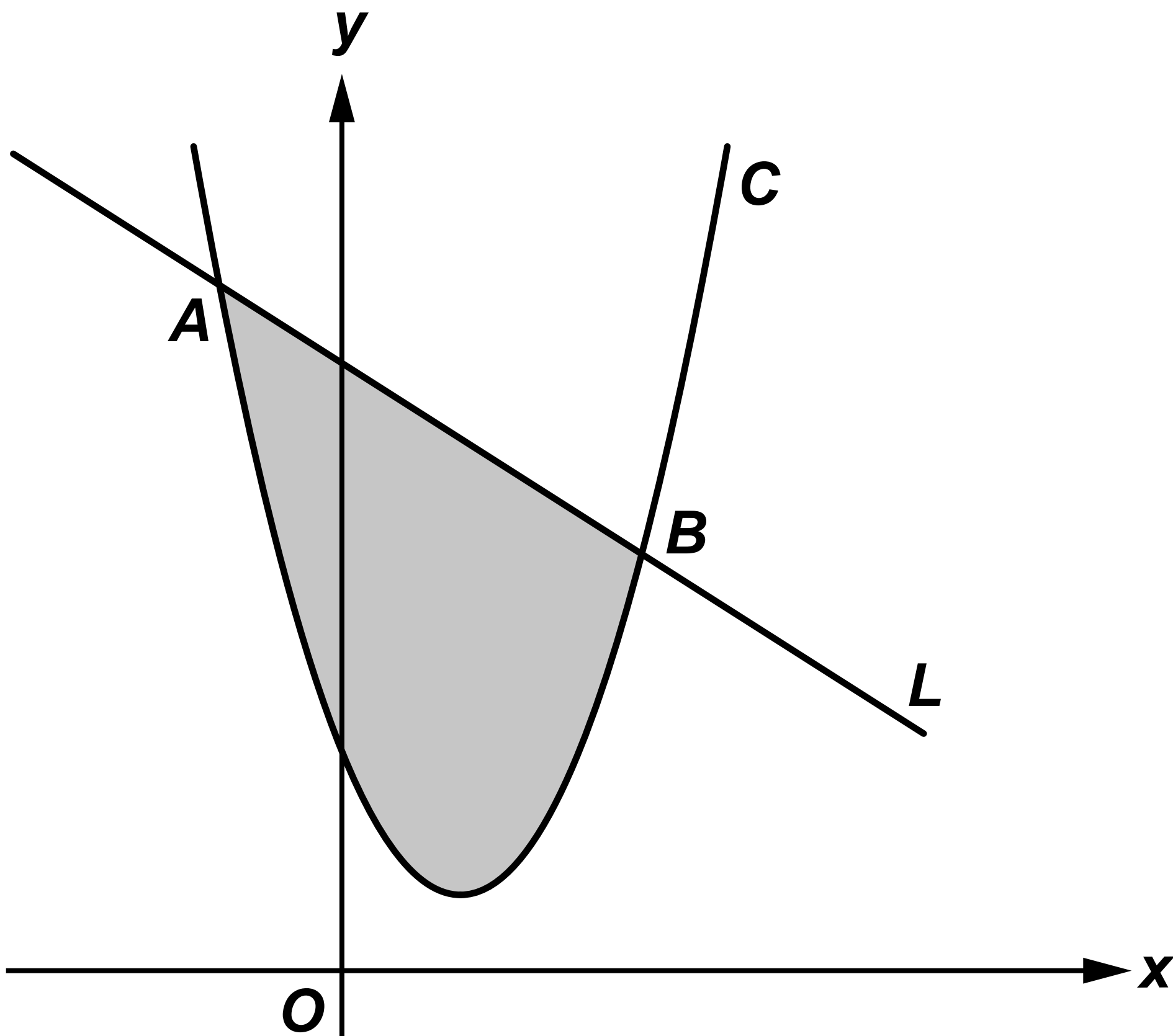
(Turn over)

3 (b)

$$\frac{3 - a\sqrt{3}}{2 + 3\sqrt{3}}$$

[3 marks]

(Turn over)



4. The diagram opposite shows a sketch of the curve C with equation $y = x^2 - 4x + 6$ and the line L with equation $y = -x + 16$. The curve and the line intersect at the points A and B .

- (a) Find the coordinates of A and B .
[4 marks]

(Turn over)

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4 (b) Calculate the area of the shaded region enclosed by C and L

[6 marks]

[illegible]

(Turn over)

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- 5. Find the range of values of k for which the quadratic equation $x^2 + kx + k + 3 = 0$ has two distinct real roots. [6 marks]**

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[illegible]

6. The function f is defined by
$$f(x) = x^3 - 3x^2 - 6x + 8$$

(a) Use an algebraic method to solve the equation $f(x) = 0$

Show all your working. [6 marks]

(Turn over)

6. The curve **C** has equation $y = f(x)$

(b) Find the X -coordinates of the stationary points of C and determine their nature. [7 marks]

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(Turn over)

(Turn over)

- 6 (c) Sketch the curve C , clearly labelling the points where the curve crosses the x and y axes.**
- [3 marks]**

7. The triangle ABC is such that
 $AB = 20\sqrt{3}$ cm, $AC = 20$ cm
and angle $ABC = 30^\circ$

Find the two possible EXACT values
of the area of the triangle ABC

[6 marks]

(Turn over)

42

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8. A circle **C** has centre **A** and equation $x^2 + y^2 + 2x - 4y = 4$
- (a) Find the coordinates of **A** and the radius of **C** [3 marks]

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8 (b) (i)

A straight line L , with equation $y = 2x + 1$ intersects the circle C at the points P and Q

Determine the coordinates of P and Q [4 marks]

(ii) Find the gradient of the tangent at each of the points P and Q [3 marks]

(Turn over)

[illegible]

(Turn over)

9. Given that $y = 2x^2 + x$

find $\frac{dy}{dx}$ from first principles.

[5 marks]

(Turn over)

- 10. Solve the following equation for values of θ between 0° and 360° [6 marks]**

$$15 \sin^2 \theta + 2 \cos \theta = 14$$

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[illegible]

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(Turn over)

11. The function f is defined by

$$f(x) = x^3 - 9x^2 + 28x + 4$$

(a) Show that $f(x)$ is an increasing function. [4 marks]

(Turn over)

65

[illegible]

(Turn over)

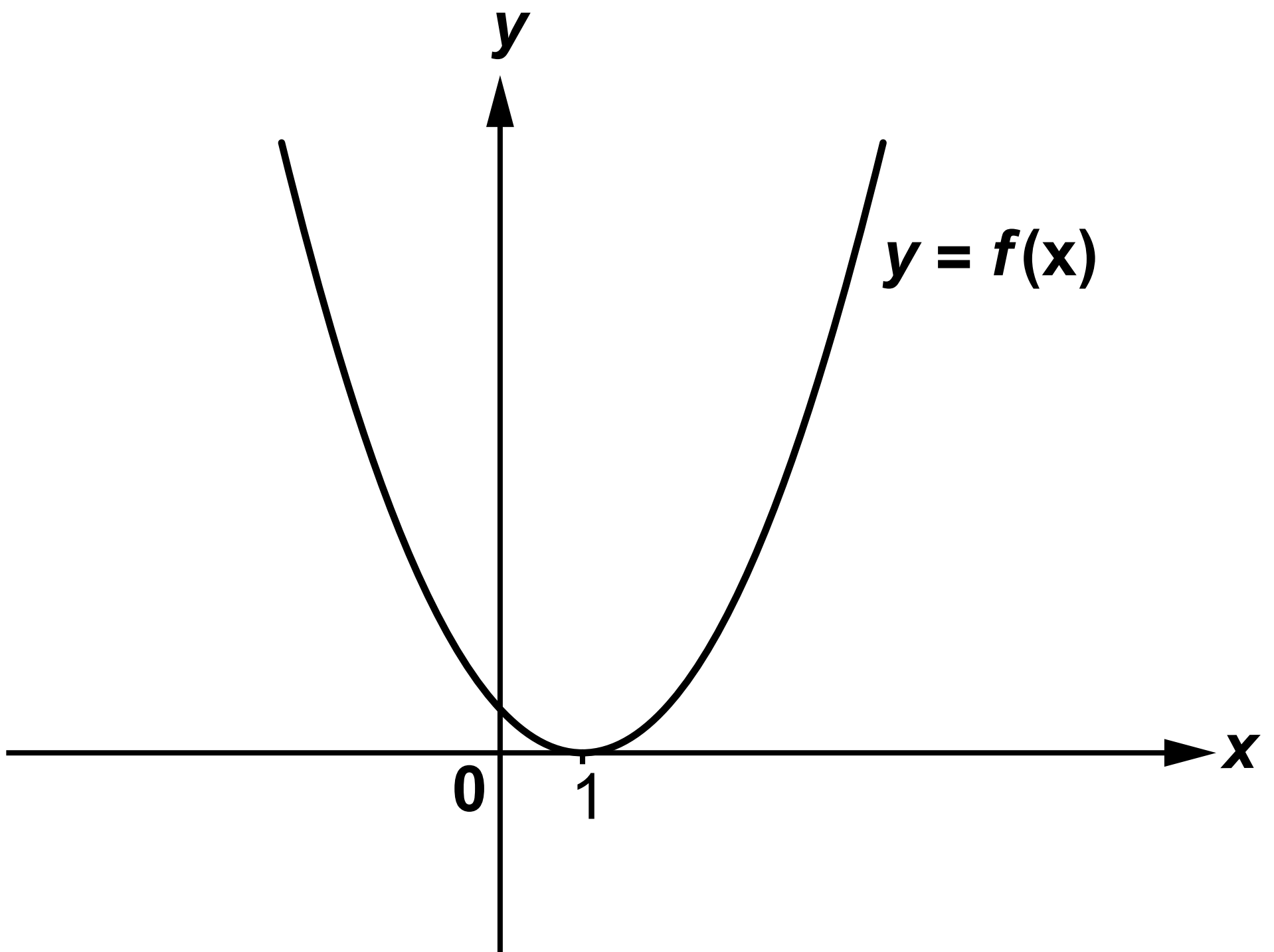
11 (b)

Two straight lines, both with
gradient 4, are tangents to the curve
 $y = f(x)$

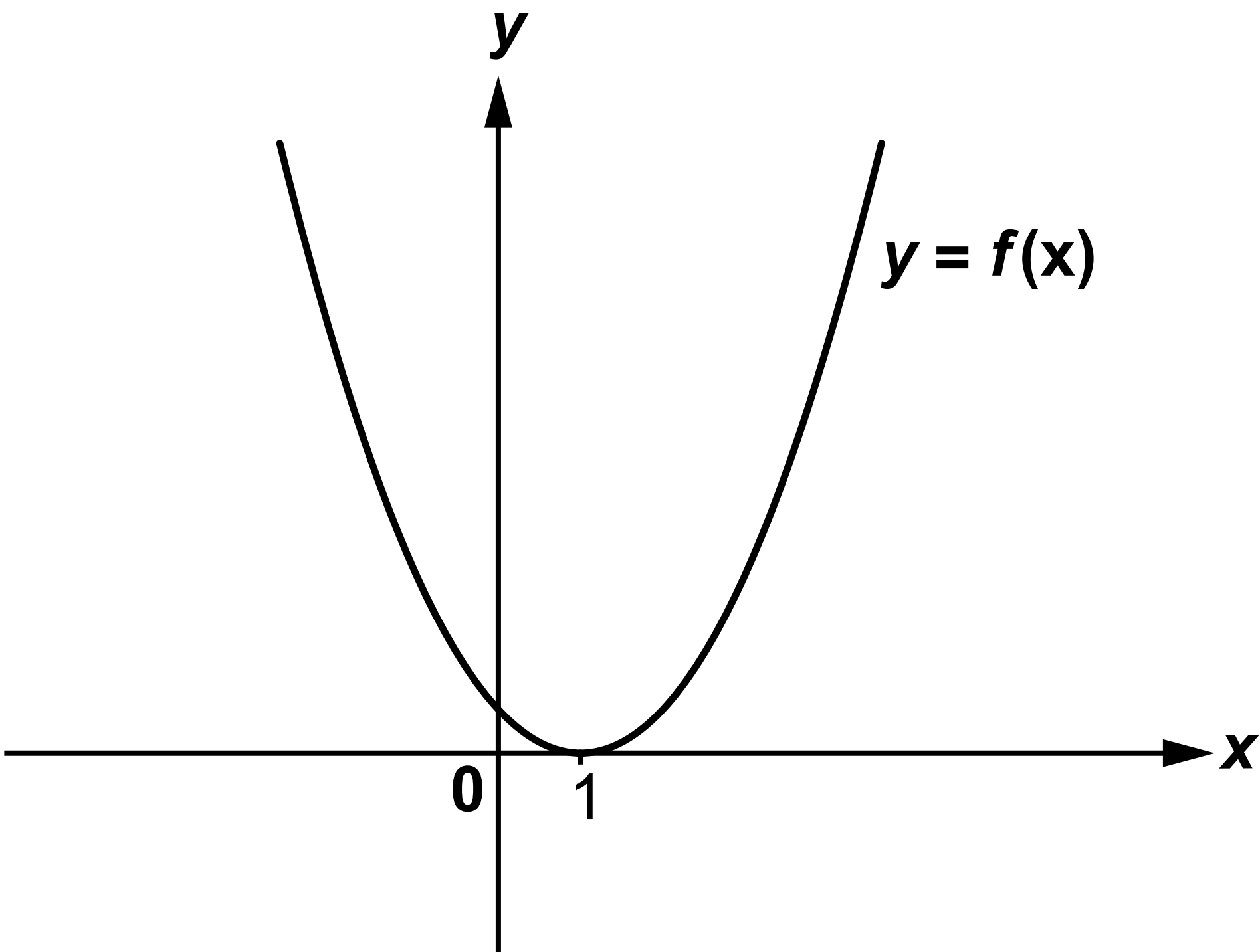
Find the equation of each of these
tangents. [5 marks]

(Turn over)

12. The diagram below shows the graph of $y = f(x)$

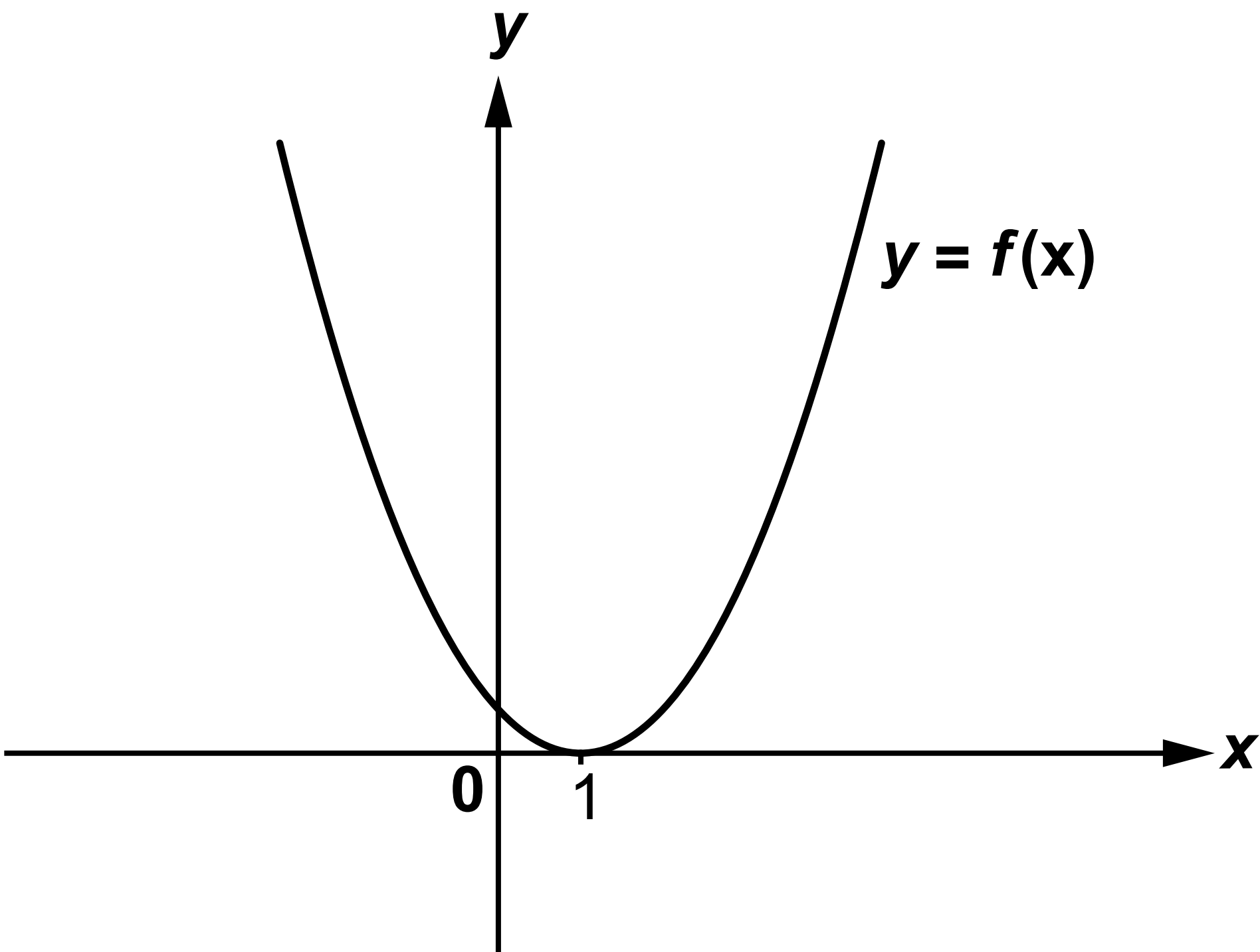


(Turn over)



- 12. Draw a sketch of each of the following transformations on the diagrams provided. Clearly label the coordinates of the stationary point in each case.**

(a) $y = f(x + 4)$ [2 marks]



12 (b)

$$y = f\left(\frac{1}{2}x\right)$$

[2 marks]

(Turn over)

**13. Given that $3 \sin^2 x - \cos^2 x = 2$
prove that $\sin^2 x = 3 \cos^2 x$**

Hence, or otherwise, find the possible values of $\tan x$ [4 marks]

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[illegible]

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14. The position vectors of the points A and C relative to a fixed origin O are given by $\underline{a} = (3\underline{i} + 4\underline{j})$ and $\underline{c} = (-5\underline{i} + 12\underline{j})$ respectively. The point B is such that $OABC$ is a parallelogram. Find the position vector of B and hence calculate the length of OB [4 marks]
-
-
-
-
-
-
-
-
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$$\log_3 36 - 2\log_3 18 + \log_3 180 + \log_3 x = 2$$

15 (a) Showing all your working, solve the equation opposite. [5 marks]

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(Turn over)

(Turn over)

15 (b)

Showing all your working, solve the following equation.

$$2 \times 4^x + 5 \times 2^x - 3 = 0$$

[6 marks]

(Turn over)

(Turn over)

$$(2 - x^2)^7 = a_0 + a_1x^2 + a_2x^4 + a_3x^6 + a_4x^8 + a_5x^{10} + a_6x^{12} + a_7x^{14}$$

16. The binomial expansion of $(2 - x^2)^7$ is given by the equation opposite.

(a) Find the numerical values of a_0 , a_2
and a_7 [4 marks]

(Turn over)

(Turn over)

16 (b)

Using a suitable numerical value for X , show that

$$a_1 + a_2 + a_3 + a_4 + a_5 + a_6 = -126$$

[3 marks]

(Turn over)

(Turn over)

END OF PAPER

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[illegible]

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