



**Surname** \_\_\_\_\_

**Other Names** \_\_\_\_\_

**Centre Number** \_\_\_\_\_

**Candidate Number** \_\_\_\_\_

**Candidate Signature** \_\_\_\_\_

**I declare this is my own work.**

**Level 2 Certificate**

**FURTHER MATHEMATICS**

**Paper 1 Non-Calculator**

**8365/1**

**Time allowed: 1 hour 45 minutes**

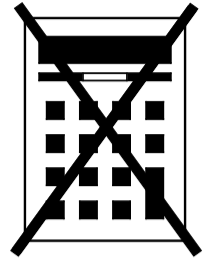
**At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.**

**[Turn over]**



**For this paper you must have:**

- **mathematical instruments**
  - **the Formulae Sheet (enclosed).**
- You must NOT use a calculator.**



## **INSTRUCTIONS**

- **Use black ink or black ball-point pen. Draw diagrams in pencil.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do not write on blank pages.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**



- **In all calculations, show clearly how you work out your answer.**

## **INFORMATION**

- **The marks for questions are shown in brackets.**
- **The maximum mark for this paper is 80.**
- **You may ask for more graph paper and tracing paper. These must be tagged securely to this answer book.**

**DO NOT TURN OVER UNTIL TOLD TO DO SO**



**Answer ALL questions in the spaces provided.**

**1  $(x + 1)$  is increased by 20%**

**Its value is now the same as  $(x + 6)$**

**Work out the value of  $x$ . [3 marks]**

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**Answer** \_\_\_\_\_

- 2 The point  $(-6, -4)$  lies on a straight line with gradient  $\frac{3}{2}$

Work out the coordinates of the point where the line crosses the  $y$ -axis.  
[2 marks]

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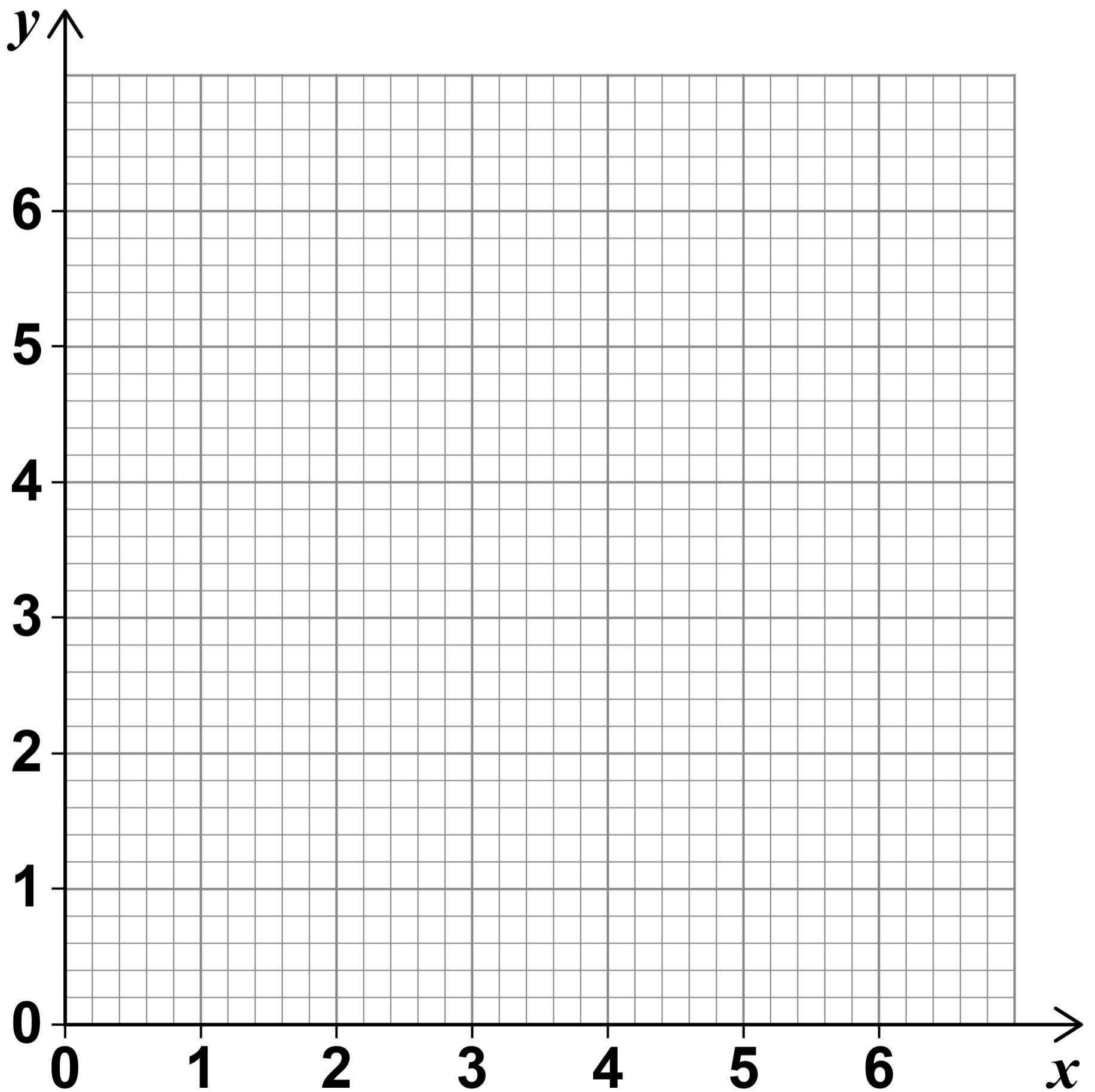
Answer ( \_\_\_\_\_ , \_\_\_\_\_ )

[Turn over]



$$\begin{aligned} 3(a) \quad f(x) &= 4 - x & 0 \leq x < 1 \\ &= 4x - x^2 & 1 \leq x < 4 \\ &= 2x - 8 & 4 \leq x \leq 6 \end{aligned}$$

On the grid, draw the graph of  $y = f(x)$  [4 marks]



**3 (b)**  $g(x) = 6 - 3x$

**Work out  $g^{-1}(x)$ . [2 marks]**

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**Answer** \_\_\_\_\_

**[Turn over]**

<b>11</b>



4 (a) Circle the value of  $\tan^2 30^\circ$   
[1 mark]

$$\frac{1}{4}$$

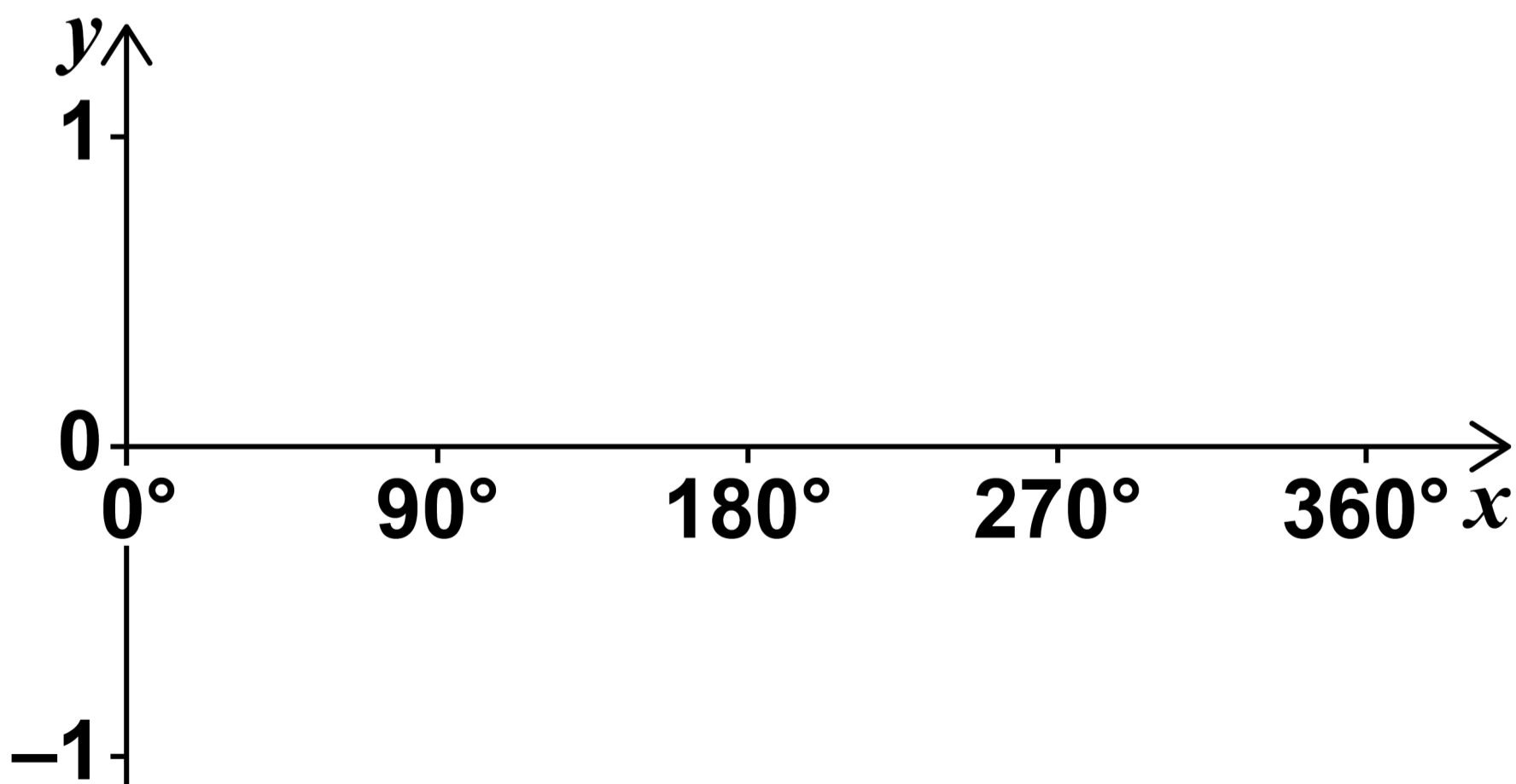
$$\frac{1}{3}$$

$$\frac{1}{2}$$

$$\frac{3}{4}$$

4 (b) On the axes, sketch

$y = \cos x$  for  $0^\circ \leq x \leq 360^\circ$   
[2 marks]





$$5 \quad (3x + a)(5x - 4) \equiv 15x^2 - 2x + b$$

Work out the values of  $a$  and  $b$ .

[3 marks]

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$$a = \underline{\hspace{4cm}} \quad b = \underline{\hspace{4cm}}$$

[Turn over]



$$6 \quad y = 2x^4 \left( x^3 + 2 - \frac{3}{x} \right)$$

Work out  $\frac{dy}{dx}$  [3 marks]

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$$\frac{dy}{dx} =$$

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**[Turn over]**



- 7  $ABC$  is a right-angled triangle with vertices  $A (-1, 5)$ ,  $B (-2, 5)$  and  $C \left(-1, 5 \frac{3}{4}\right)$

Work out the length of  $BC$ . [3 marks]



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**Answer** \_\_\_\_\_ **units**

**[Turn over]**



**8 Use MATRIX MULTIPLICATION to show that, in the  $x$ - $y$  plane,**

- **a rotation,  $90^\circ$  anticlockwise about the origin, followed by**
- **a reflection in the line  $y = x$  is equivalent to a reflection in the  $x$ -axis.**

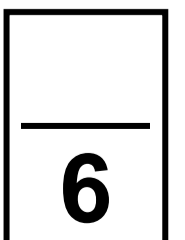
**[3 marks]**



**[Turn over]**



1 5



**9(a)** A quadratic sequence starts

**-2      -1      4      13**

**Work out an expression for the  $n$ th term. [3 marks]**

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**Answer** \_\_\_\_\_





**9(b) A different quadratic sequence has  $n$ th term  $n^2 + 10n$**

**Use an algebraic method to work out how many terms in the sequence are less than 2000**

**Do NOT use trial and improvement.**

**You MUST show your working.  
[3 marks]**

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**Answer** \_\_\_\_\_



**[Turn over]**

**10 Rationalise and simplify fully**  $\frac{\sqrt{3}}{3 + \sqrt{3}}$

**[3 marks]**

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**Answer** \_\_\_\_\_

**11 Expand and simplify fully  $(3 + 2x)^5$   
[4 marks]**

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**Answer** \_\_\_\_\_

**[Turn over]**



12 The *n*th term of a sequence is  $\frac{3n^2}{n^2 + 2}$

12(a) One term in the sequence is  $\frac{32}{11}$

Work out the value of *n*. [2 marks]

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Answer \_\_\_\_\_



**12(b) Write down the limiting value of the sequence as  $n \rightarrow \infty$  [1 mark]**

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**Answer** \_\_\_\_\_

**[Turn over]**



13 Simplify fully  $(6x^3y^{-2} + 9x^5y) \div 3x^2y^{-3}$   
[3 marks]

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Answer \_\_\_\_\_



14 Rearrange  $ef = \frac{5e + 4}{3}$  to make  $e$  the subject. [3 marks]

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Answer \_\_\_\_\_

[Turn over]

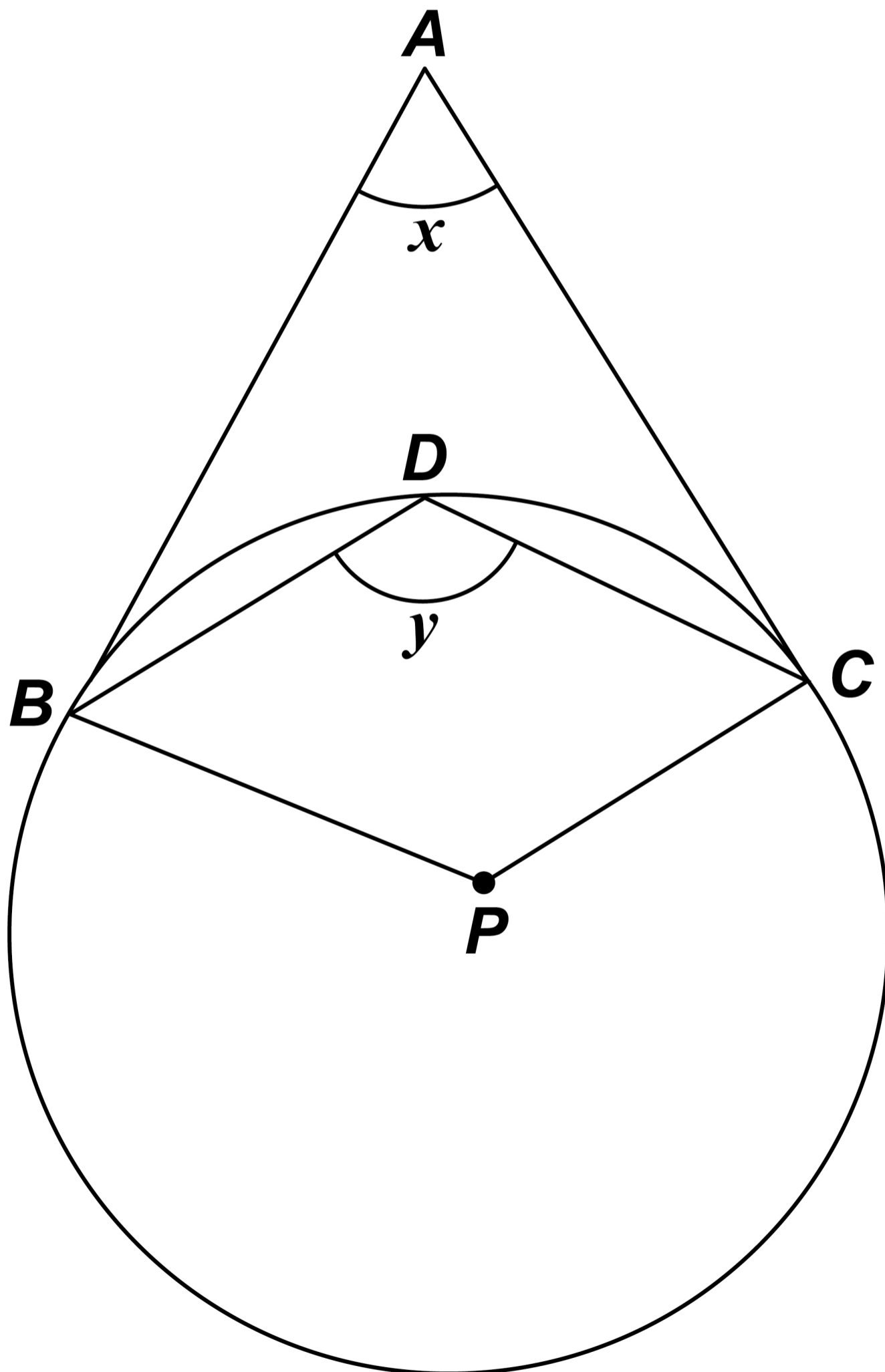
9



15 *B*, *C* and *D* are points on a circle, centre *P*.

*AB* and *AC* are tangents to the circle.

The diagram is not drawn accurately.





25

Prove that  $y = 90 + \frac{x}{2}$  [5 marks]

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[Turn over]



**16 Solve the simultaneous equations**

$$x - y = \frac{19}{4}$$

$$xy = -3$$

**Do NOT use trial and improvement.**

**You MUST show your working.**  
**[6 marks]**

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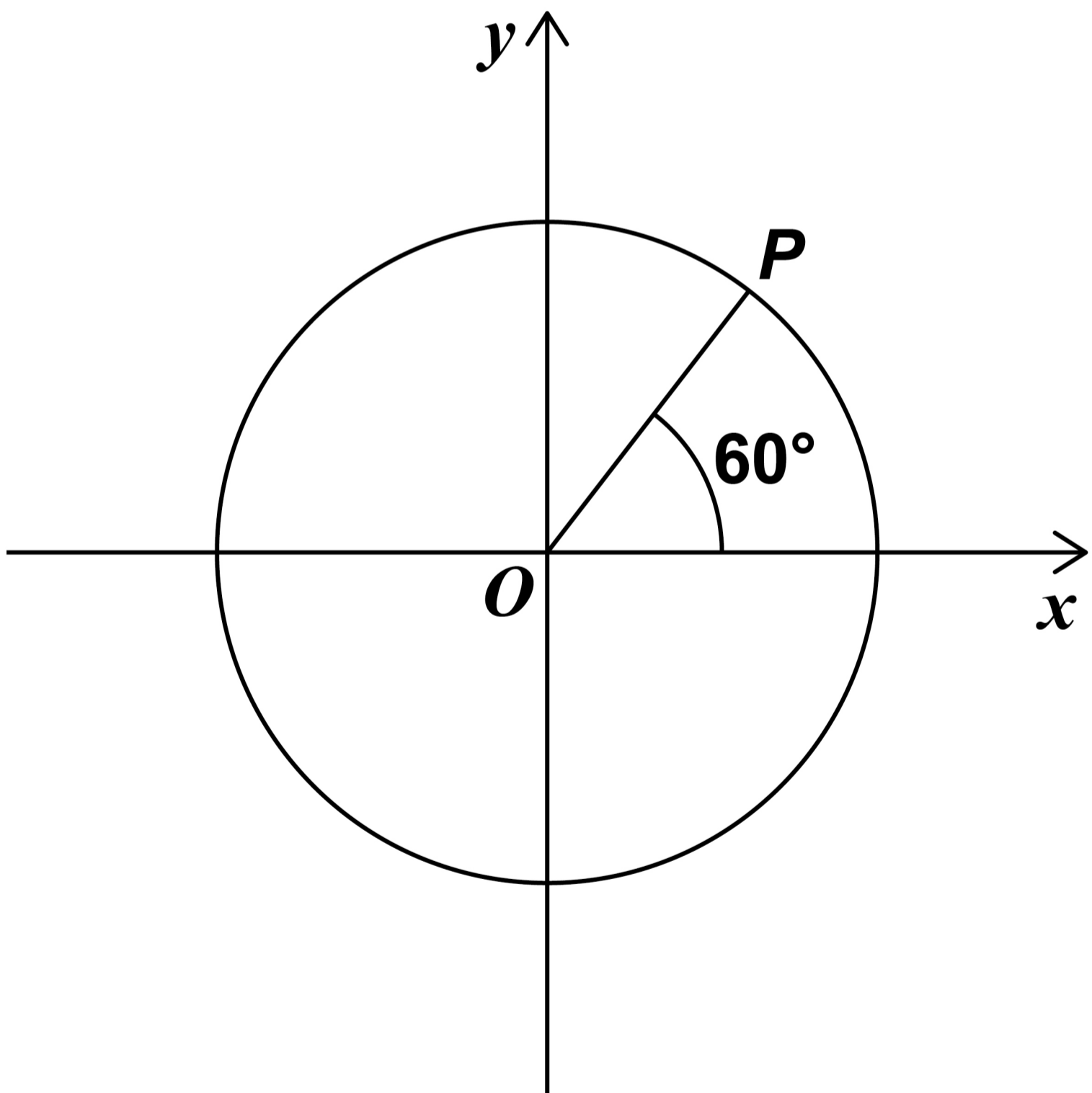




17 The point  $P$  lies on the circle  
 $x^2 + y^2 = 16$

The line  $OP$  is at an angle of  $60^\circ$  to the positive  $x$ -axis.

The diagram is not drawn accurately.



**17(a) Show that the coordinates of point  $P$  are  $(2, 2\sqrt{3})$  [2 marks]**

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**[Turn over]**



**17(b) Work out the equation of the tangent to the circle at  $P$ .**

**Write your answer in the form  $x + ay = b$  where  $a$  and  $b$  are constants. [4 marks]**

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**Answer** \_\_\_\_\_

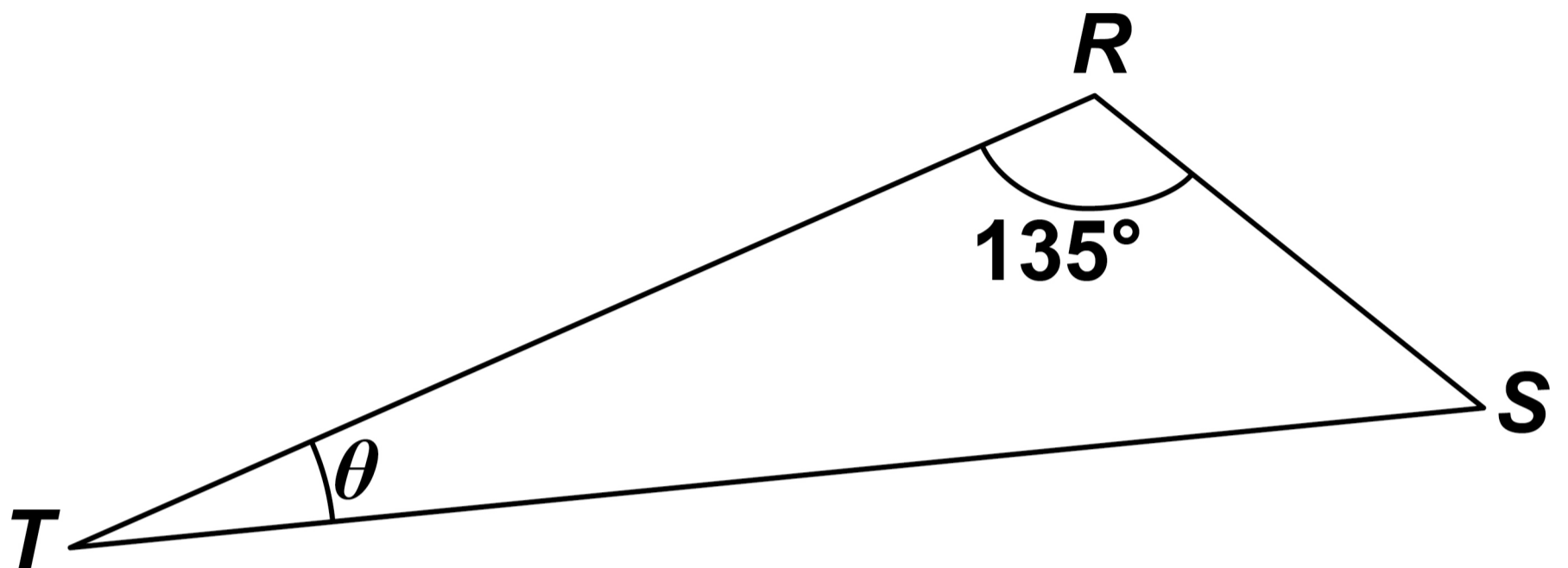
**[Turn over]**

6



18 In triangle  $RST$   $RS : ST = 1 : 4$

The diagram is not drawn accurately.



Work out the exact value of  $\sin \theta$ .  
[3 marks]

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**Answer** \_\_\_\_\_

**[Turn over]**



- 19 Write  $6x^2 - 24x + 17$  in the form  $a(x + b)^2 + c$  where  $a$ ,  $b$  and  $c$  are integers. [3 marks]

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**Answer** \_\_\_\_\_

**[Turn over]**

6



**20** The curve  $y = x^4 - 18x^2$  has three stationary points.

**Work out the coordinates of the three stationary points and determine their nature.**

**You MUST show your working.  
[6 marks]**

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**Stationary point** ( \_\_\_\_\_ , \_\_\_\_\_ )

**Nature** \_\_\_\_\_

**Stationary point** ( \_\_\_\_\_ , \_\_\_\_\_ )

**Nature** \_\_\_\_\_

**Stationary point** ( \_\_\_\_\_ , \_\_\_\_\_ )

**Nature** \_\_\_\_\_

**[Turn over]**



21 Show that

$$\frac{4 \cos^2 x + 3 \sin^2 x - 4}{\cos^2 x} \equiv -\tan^2 x$$

[3 marks]

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**END OF QUESTIONS**

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**Additional page, if required.  
Write the question numbers in the  
left-hand margin.**

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For Examiner's Use	
Pages	Mark
4–7	
8–10	
12–15	
16–19	
20–23	
24–27	
28–31	
32–35	
36–39	
<b>TOTAL</b>	

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4 2



2 2 6 G 8 3 6 5 / 1