



# Differentiation (Gradients, Tangents, Normals)

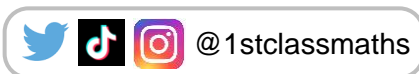
Revise this topic →



← Check your work

This booklet features original exam style questions designed by me. They do not feature in past papers but are good practice for your exams.

The content is designed to reflect the style of the **AQA Level 2 Certificate in Further Maths**.  
It may not be suitable for other courses.





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

Do not write  
outside the  
box

1 Work out the gradient of the curve  $y = x^3 - 5x^2 + 7x + 9$   
at the point where  $x = 3$

[3 marks]

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Answer \_\_\_\_\_

2 Work out the gradient of the curve  $y = x^4 + 4x$   
at the point where  $x = -2$

[3 marks]

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Answer \_\_\_\_\_





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3 Work out the gradient of the curve  $y = 8 - \frac{3}{x}$   
at the point where  $x = 2$

[3 marks]

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Answer \_\_\_\_\_

4 Work out the gradient of the curve  $y = (x^2 + 1)^2$   
at the point where  $x = 1$

[4 marks]

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Answer \_\_\_\_\_

Turn over ►





5  $y = 3x^2 - 5x + 1$

Work out the value of  $x$  at which the rate of change of  $y$  with respect to  $x$  is  $-2$

[4 marks]

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Answer \_\_\_\_\_

6  $y = 3x - \frac{4}{x^2}$

Work out the value of  $x$  at which the rate of change of  $y$  with respect to  $x$  is  $2$

[4 marks]

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Answer \_\_\_\_\_





Do not write  
outside the  
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7  $y = 2x^3 - 3x^2 - 12x$

Work out the values of  $x$  at which the rate of change of  $y$  with respect to  $x$  is 24

[4 marks]

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Answer \_\_\_\_\_

8  $y = 6x + \frac{4}{x}$

Work out the values of  $x$  at which the rate of change of  $y$  with respect to  $x$  is -3

[5 marks]

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Answer \_\_\_\_\_

Turn over ►





9  $y = ax^3 - 4x$

At  $x = 1$  the rate of change of  $y$  with respect to  $x$  is 17

Work out the value of  $a$ .

[3 marks]

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Answer \_\_\_\_\_

10  $y = x^2 - \frac{a}{x}$

At  $x = 5$  the rate of change of  $y$  with respect to  $x$  is 16

Work out the value of  $a$ .

[4 marks]

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Answer \_\_\_\_\_





Do not write  
outside the  
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11 A curve has equation  $y = x^3 + 3x$

Work out the equation of the tangent to the curve at the point (2, 14) [4 marks]

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Answer \_\_\_\_\_

12 A curve has equation  $y = x^5 - 2x$

Work out the equation of the **normal** to the curve at the point (1, -1) [4 marks]

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Answer \_\_\_\_\_

Turn over ►





Do not write  
outside the  
box

13  $P$  is the point on the curve  $y = \frac{x^2 + 7}{4}$  where  $x = 1$

13 (a) Work out the equation of the **normal** to the curve at  $P$ . **[5 marks]**

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Answer \_\_\_\_\_

13 (b) The normal at  $P$  also intersects the curve at  $Q$ .

Work out the coordinates of  $Q$ . **[5 marks]**

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$Q = ( \text{_____}, \text{_____} )$

$\frac{\quad}{9}$

