

**1** The curve **C** has equation  $y = 5x^3 - x^2 - 6x + 4$

(a) Find  $\frac{dy}{dx}$

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

(2)

There are two points on the curve **C** at which the gradient of the curve is 2

(b) Find the  $x$  coordinate of each of these two points.  
Show clear algebraic working.

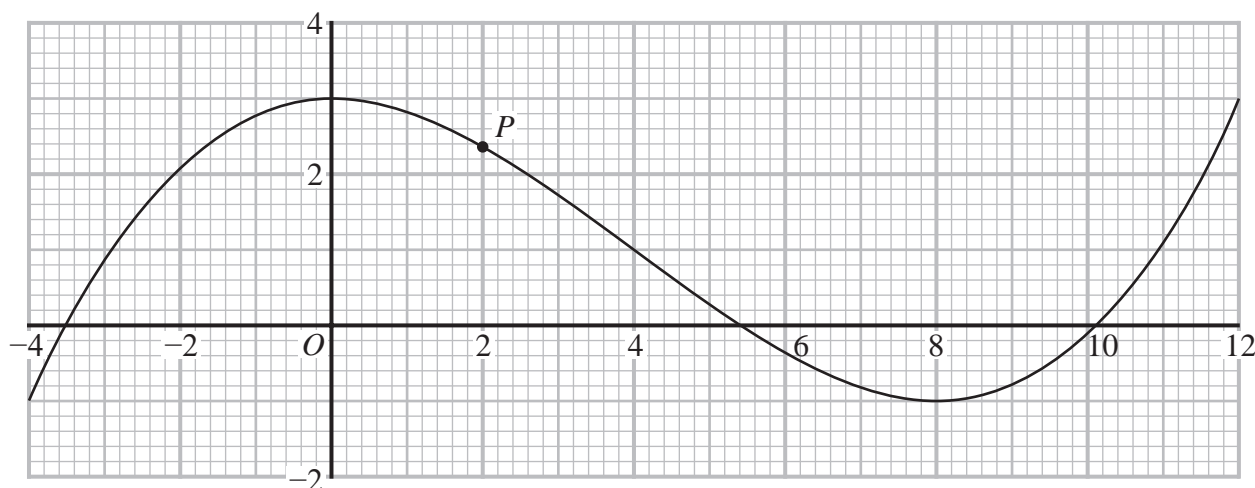
.....

(4)

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(Total for Question 1 is 6 marks)

- 2 The diagram shows the graph of  $y = f(x)$  for  $-4 \leq x \leq 12$



The point  $P$  on the curve has  $x$  coordinate 2

- (a) (i) Use the graph to find an estimate for the gradient of the curve at  $P$ .

.....  
(3)

- (ii) Hence find an equation of the tangent to the curve at  $P$ .  
Give your answer in the form  $y = mx + c$

.....  
(2)

The equation  $f(x) = k$  has exactly two different solutions for  $-4 \leq x \leq 12$

- (b) Use the graph to find the two possible values of  $k$ .

..... , .....  
(2)

(Total for Question 2 is 7 marks)

**3** The curve **C** has equation  $y = 2(x + 4)^2 - 12(x + 4) + 3$

The point **M** is the minimum point on **C**

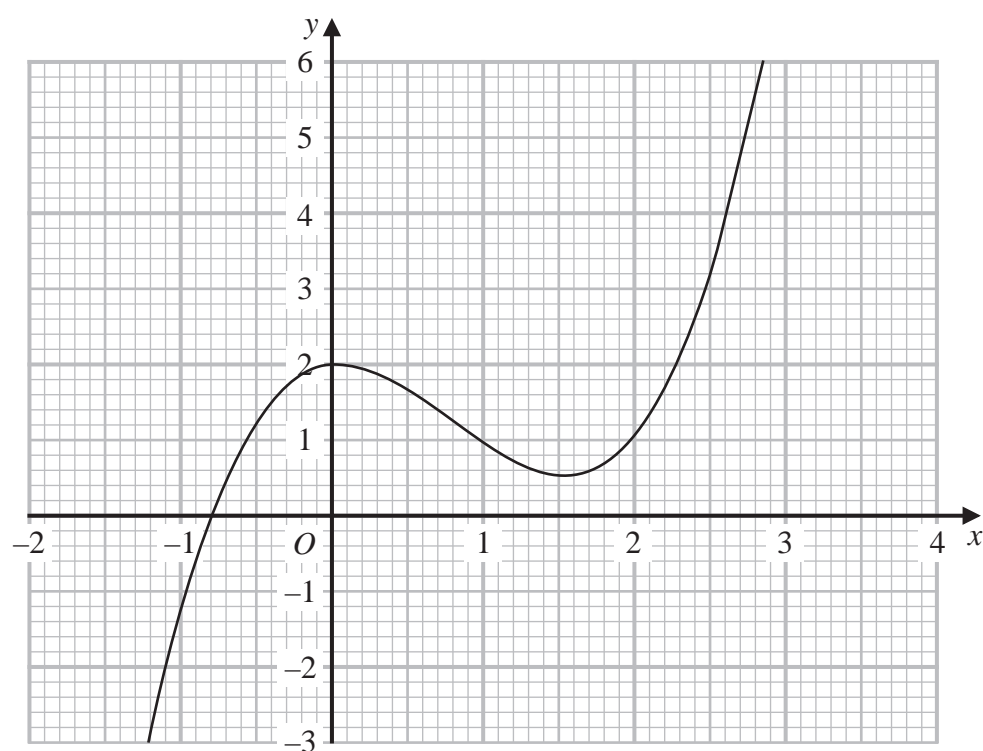
(b) Find the coordinates of **M**

(..... , .....)  
(2)

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(Total for Question 3 is 2 marks)

4 Part of the curve with equation  $y = f(x)$  is shown on the grid.



Find an estimate for the gradient of the curve at the point where  $x = 2$   
Show your working clearly.

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(Total for Question 4 is 3 marks)

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**5** The curve **C** has equation  $y = ax^3 + bx^2 - 12x + 6$  where  $a$  and  $b$  are constants.

The point  $A$  with coordinates  $(2, -6)$  lies on **C**

The gradient of the curve at  $A$  is 16

Find the  $y$  coordinate of the point on the curve whose  $x$  coordinate is 3

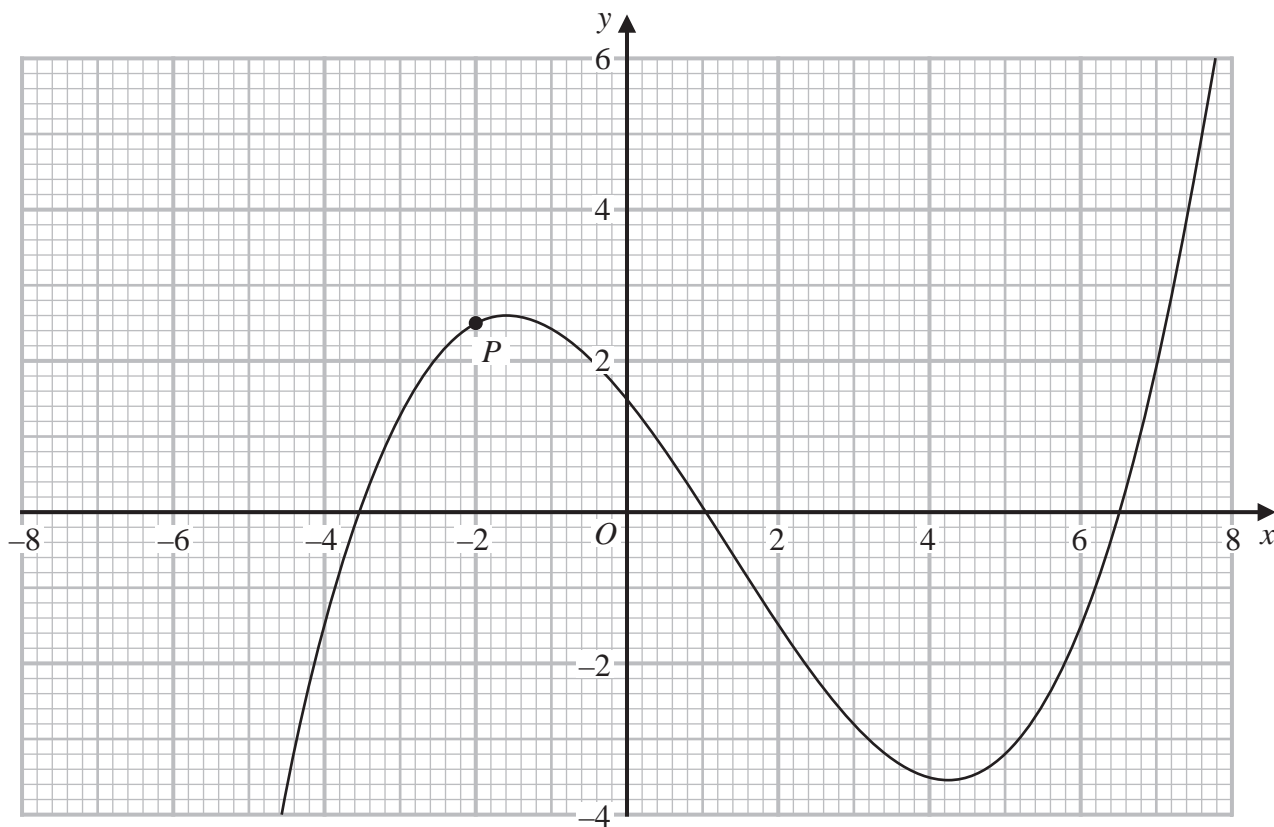
Show clear algebraic working.

$y = \dots\dots\dots$

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**(Total for Question 5 is 6 marks)**

6 The diagram shows the graph of  $y = f(x)$



The point  $P$  has  $x$  coordinate  $-2$

Use the graph to find an estimate for the gradient of the curve at  $P$

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(Total for Question 6 is 3 marks)

7 The curve **T** has equation  $y = x^3 - 2x^2 - 9x + 15$

(a) Find  $\frac{dy}{dx}$

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

(2)

(b) Find the range of values of  $x$  for which **T** has a positive gradient.  
Give your values correct to 3 significant figures.  
Show your working clearly.

(4)

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(Total for Question 7 is 6 marks)

**8** The curve **C** has equation  $y = 4x^3 + x^2 - 20x$

(a) Find  $\frac{dy}{dx}$

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

(2)

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**(Total for Question 8 is 2 marks)**