



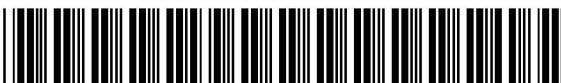
**2** The curve  $y = x^2 - \frac{a}{x}$  has a stationary point at  $(-3, b)$ .

Find the values of the constants  $a$  and  $b$ .

[4]

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- 5** The equation of a curve is such that  $\frac{dy}{dx} = 4x - 3\sqrt{x} + 1$ .

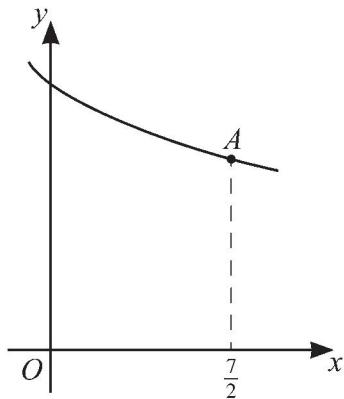
- (a) Find the  $x$ -coordinate of the point on the curve at which the gradient is  $\frac{11}{2}$ .

[3]

- (b) Given that the curve passes through the point  $(4, 11)$ , find the equation of the curve.

[4]





The diagram shows part of the curve with equation  $y = \frac{12}{\sqrt[3]{2x+1}}$ . The point  $A$  on the curve has coordinates  $\left(\frac{7}{2}, 6\right)$ .

- (a) Find the equation of the tangent to the curve at  $A$ . Give your answer in the form  $y = mx + c$ . [4]





- (b) Find the area of the region bounded by the curve and the lines  $x = 0$ ,  $x = \frac{7}{2}$  and  $y = 0$ . [4]





**9** The equation of a curve is  $y = 4 + 5x + 6x^2 - 3x^3$ .

- (a) Find the set of values of  $x$  for which  $y$  decreases as  $x$  increases.

[4]





(b) It is given that  $y = 9x + k$  is a tangent to the curve.

Find the value of the constant  $k$ .

[4]

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- 3 The equation of a curve is  $y = 2x^2 - 3$ . Two points  $A$  and  $B$  with  $x$ -coordinates 2 and  $(2 + h)$  respectively lie on the curve.

- (a) Find and simplify an expression for the gradient of the chord  $AB$  in terms of  $h$ .

[3]

- (b) Explain how the gradient of the curve at the point  $A$  can be deduced from the answer to part (a), and state the value of this gradient. [2]

[2]





- 10 A function  $f$  with domain  $x > 0$  is such that  $f'(x) = 8(2x - 3)^{\frac{1}{3}} - 10x^{\frac{2}{3}}$ . It is given that the curve with equation  $y = f(x)$  passes through the point  $(1, 0)$ .

(a) Find the equation of the normal to the curve at the point  $(1, 0)$ .

[3]

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.....  
.....  
.....

(b) Find  $f(x)$ .

[4]





It is given that the equation  $f'(x) = 0$  can be expressed in the form

$$125x^2 - 128x + 192 = 0.$$

- (c) Determine, making your reasoning clear, whether  $f$  is an increasing function, a decreasing function or neither. [3]





- 11 The equation of a curve is  $y = kx^{\frac{1}{2}} - 4x^2 + 2$ , where  $k$  is a constant.

- (a) Find  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  in terms of  $k$ .

[2]

- (b) It is given that  $k = 2$ .

Find the coordinates of the stationary point and determine its nature.

[4]





(c) Points  $A$  and  $B$  on the curve have  $x$ -coordinates 0.25 and 1 respectively. For a different value of  $k$ , the tangents to the curve at the points  $A$  and  $B$  meet at a point with  $x$ -coordinate 0.6.

Find this value of  $k$ .

[6]

