

- 4 The equation of a curve is $y = f(x)$, where $f(x) = (2x - 1)\sqrt{3x - 2} - 2$. The following points lie on the curve. Non-exact values have been given correct to 5 decimal places.

$A(2, 4)$, $B(2.0001, k)$, $C(2.001, 4.00625)$, $D(2.01, 4.06261)$, $E(2.1, 4.63566)$, $F(3, 11.22876)$

- (a) Find the value of k . Give your answer correct to 5 decimal places. [1]

.....

.....

.....

.....

The table shows the gradients of the chords AB , AC , AD and AF .

Chord	AB	AC	AD	AE	AF
Gradient of chord	6.2501	6.2511	6.2608		7.2288

- (b) Find the gradient of the chord AE . Give your answer correct to 4 decimal places. [1]

.....

.....

.....

.....

.....

.....

.....

.....

- (c) Deduce the value of $f'(2)$ using the values in the table. [1]

.....

.....

.....

.....

.....

.....

.....

.....

- 3 The equation of a curve is $y = (x - 3)\sqrt{x + 1} + 3$. The following points lie on the curve. Non-exact values are rounded to 4 decimal places.

$A(2, k)$ $B(2.9, 2.8025)$ $C(2.99, 2.9800)$ $D(2.999, 2.9980)$ $E(3, 3)$

- (a) Find k , giving your answer correct to 4 decimal places. [1]

.....

.....

.....

.....

- (b) Find the gradient of AE , giving your answer correct to 4 decimal places. [1]

.....

.....

.....

.....

.....

.....

The gradients of BE , CE and DE , rounded to 4 decimal places, are 1.9748, 1.9975 and 1.9997 respectively.

- (c) State, giving a reason for your answer, what the values of the four gradients suggest about the gradient of the curve at the point E . [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....



- 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]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



[4]

pastpaperpenguin.com



- 11 The gradient of a curve is given by $\frac{dy}{dx} = 6(3x - 5)^3 - kx^2$, where k is a constant. The curve has a stationary point at $(2, -3.5)$.

(c) Find $\frac{d^2y}{dx^2}$. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(d) Determine the nature of the stationary point at $(2, -3.5)$. [2]

.....

.....

.....

.....

.....

.....

.....

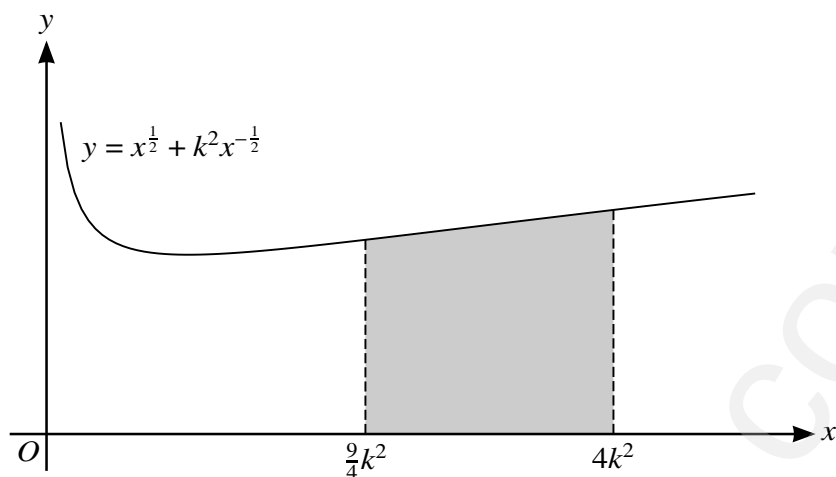
.....

.....

.....

.....

.....



(a) Find the coordinates of the minimum point of the curve, giving your answer in terms of k . [4]

pastpaperpeng

- 10** At the point $(4, -1)$ on a curve, the gradient of the curve is $-\frac{3}{2}$. It is given that $\frac{dy}{dx} = x^{-\frac{1}{2}} + k$, where k is a constant.

(c) Find the coordinates of the stationary point. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(d) Determine the nature of the stationary point. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

9 The equation of a curve is $y = (3 - 2x)^3 + 24x$.

(a) Find expressions for $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$. [4]

pastpaperpenguin.com

(b) Find the coordinates of each of the stationary points on the curve.

[3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) Determine the nature of each stationary point.

[2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 9** The equation of a curve is $y = 3x + 1 - 4(3x + 1)^{\frac{1}{2}}$ for $x > -\frac{1}{3}$.

(a) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

[3]

pastpaperpenguin.com

www.pastpaperpenguin.com

5 The equation of a curve is $y = 2x^2 - \frac{1}{2x} + 3$.

- (a) Find the coordinates of the stationary point. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) Determine the nature of the stationary point. [2]

.....

.....

.....

.....

.....

.....

.....

- (c) For positive values of x , determine whether the curve shows a function that is increasing, decreasing or neither. Give a reason for your answer. [2]

.....

.....

.....

.....

.....

.....

.....

- 10** The gradient of a curve at the point (x, y) is given by $\frac{dy}{dx} = 2(x + 3)^{\frac{1}{2}} - x$. The curve has a stationary point at $(a, 14)$, where a is a positive constant.

(a) Find the value of a .

[3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Determine the nature of the stationary point.

[3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 11 The equation of a curve is

$$y = k\sqrt{4x+1} - x + 5,$$

where k is a positive constant.

- (a) Find $\frac{dy}{dx}$. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (b) Find the x -coordinate of the stationary point in terms of k . [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- 8** The equation of a curve is such that $\frac{dy}{dx} = 3x^{\frac{1}{2}} - 3x^{-\frac{1}{2}}$. The curve passes through the point (3, 5).

(b) Find the x -coordinate of the stationary point.

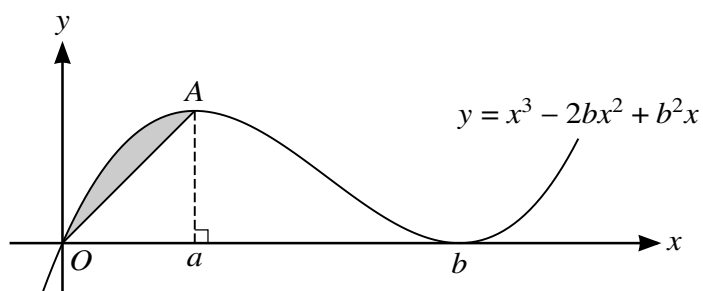
[2]

[illegible]

(c) State the set of values of x for which y increases as x increases.

[1]

11



The diagram shows part of the curve with equation $y = x^3 - 2bx^2 + b^2x$ and the line OA , where A is the maximum point on the curve. The x -coordinate of A is a and the curve has a minimum point at $(b, 0)$, where a and b are positive constants.

- (a) Show that $b = 3a$. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (a) Find, in terms of k , the values of x at which there is a stationary point. [4]

pastpaperpenguin.com

The function f has a stationary value at $x = a$ and is defined by

$$f(x) = 4(3x - 4)^{-1} + 3x \quad \text{for } x \geq \frac{3}{2}.$$

- (b) Find the value of a and determine the nature of the stationary value. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- (c) The function g is defined by $g(x) = -(3x + 1)^{-1} + 3x$ for $x \geq 0$.

Determine, making your reasoning clear, whether g is an increasing function, a decreasing function or neither. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....