

Higher Mathematics

Differentiation - Questions - 2013-2017

Marks are indicated in brackets after each question number

2013 Paper 1 Question 2, (2)

The point P (5, 12) lies on the curve with equation $y = x^2 - 4x + 7$.

What is the gradient of the tangent to this curve at P?

2013 Paper 1 Question 18, (2)

Given that $y = \sin(x^2 - 3)$, find $\frac{dy}{dx}$.

2014 Paper 1 Question 8, (2)

What is the derivative of $(4 - 9x^4)^{\frac{1}{2}}$?

2014 Paper 1 Question 9, (2)

$\sin x + \sqrt{3} \cos x$ can be written as $2 \cos\left(x - \frac{\pi}{6}\right)$.

The maximum value of $\sin x + \sqrt{3} \cos x$ is 2.

What is the maximum value of $5 \sin 2x + 5\sqrt{3} \cos 2x$?

2014 Paper 1 Question 21, (6) (2)

A curve has equation $y = 3x^2 - x^3$.

- Find the coordinates of the stationary points on this curve and determine their nature.
- State the coordinates of the points where the curve meets the coordinate axes and sketch the curve.

2014 Paper 2 Question 2, (4)

A curve has equation $y = x^4 - 2x^3 + 5$.

Find the equation of the tangent to this curve at the point where $x = 2$.

2015 Paper 1 Question 2, (4)

Find the equation of the tangent to the curve $y = 2x^3 + 3$ at the point where $x = -2$.

2015 Paper 1 Question 7, (4)

A function f is defined on a suitable domain by $f(x) = \sqrt{x} \left(3x - \frac{2}{x\sqrt{x}} \right)$.

Find $f'(4)$.

2016 Paper 1 Question 2, (3)

Given that $y = 12x^3 + 8\sqrt{x}$, where $x > 0$, find $\frac{dy}{dx}$.

2016 Paper 1 Question 9, (4) (2)

- (a) Find the x -coordinates of the stationary points on the graph with equation $y = f(x)$, where $f(x) = x^3 + 3x^2 - 24x$.
- (b) Hence determine the range of values of x for which the function f is strictly increasing.

2016 Paper 2 Question 10, (2) (1)

(a) Given that $y = (x^2 + 7)^{\frac{1}{2}}$, find $\frac{dy}{dx}$.

(b) Hence find $\int \frac{4x}{\sqrt{x^2 + 7}} dx$.

2017 Paper 1 Question 3, (2)

Given $y = (4x - 1)^{12}$, find $\frac{dy}{dx}$.

2017 Paper 1 Question 8, (3)

Calculate the rate of change of $d(t) = \frac{1}{2t}$, $t \neq 0$, when $t = 5$.

2017 Paper 2 Question 7, (4) (3)

- (a) Find the x -coordinate of the stationary point on the curve with equation $y = 6x - 2\sqrt{x^3}$.
- (b) Hence, determine the greatest and least values of y in the interval $1 \leq x \leq 9$.