



Chain, Product and Quotient Rules Introductory Questions (Sheet 2)

Q1.

$$y = \frac{5x^2 + 10x}{(x+1)^2} \quad x \neq -1$$

(a) Show that $\frac{dy}{dx} = \frac{A}{(x+1)^n}$ where A and n are constants to be found.

(4)

(b) Hence deduce the range of values for x for which $\frac{dy}{dx} < 0$

(1)

(Total for question = 5 marks)

Q2.

Given $y = x(2x + 1)^4$, show that

$$\frac{dy}{dx} = (2x + 1)^n(Ax + B)$$

where n , A and B are constants to be found.

(4)

(Total for question = 4 marks)

Q3.

The curve C has equation

$$y = (2x - 3)^5$$

The point P lies on C and has coordinates $(w, -32)$.

Find

(a) the value of w ,

(2)

(b) the equation of the tangent to C at the point P in the form $y = mx + c$, where m and c are constants.

(5)

(Total 7 marks)



Q4.

Differentiate with respect to x

(a) $\ln(x^2 + 3x + 5)$

(2)

(b) $\frac{\cos x}{x^2}$

(3)

(Total 5 marks)

Q5.

Differentiate with respect to x , giving your answer in its simplest form,

(a) $x^2 \ln(3x)$

(4)

(b) $\frac{\sin 4x}{x^3}$

(5)

(Total 9 marks)

Q6.

A curve C has equation

$$y = e^{2x} \tan x, \quad x \neq (2n+1)\frac{\pi}{2}.$$

(a) Show that the turning points on C occur where $\tan x = -1$.

(6)

(b) Find an equation of the tangent to C at the point where $x = 0$.

(2)

(Total 8 marks)

Q7.

(i) Differentiate with respect to x

(a) $x^2 \cos 3x$

(3)

(b) $\frac{\ln(x^2 + 1)}{x^2 + 1}$

(4)

(ii) A curve C has the equation

$$y = \sqrt{4x+1}, \quad x > -\frac{1}{4}, \quad y > 0$$

The point P on the curve has x -coordinate 2. Find an equation of the tangent to C at P in the form $ax + by + c = 0$, where a , b and c are integers.

(6)

(Total 13 marks)

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Q8.

A curve C has equation

$$y = \frac{3}{(5-3x)^2}, \quad x \neq \frac{5}{3}$$

The point P on C has x -coordinate 2. Find an equation of the normal to C at P in the form $ax + by + c = 0$, where a , b and c are integers.

(7)

(Total 7 marks)

Q9.

Given that

$$y = \frac{x-4}{2+\sqrt{x}} \quad x > 0$$

show that

$$\frac{dy}{dx} = \frac{1}{A\sqrt{x}} \quad x > 0$$

where A is a constant to be found.

(Total for question = 4 marks)

Q10.

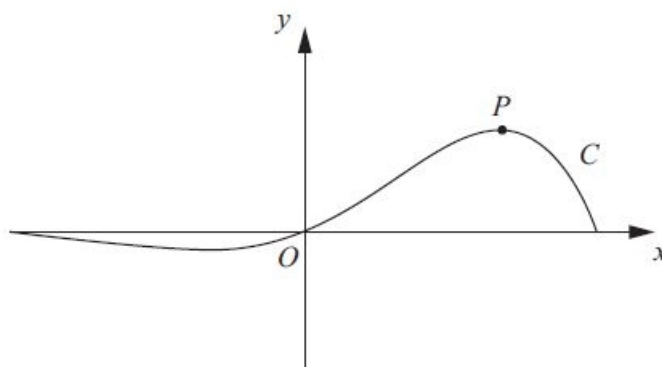


Figure 1

Figure 1 shows a sketch of the curve C which has equation

$$y = e^{x^3} \sin 3x, \quad -\frac{\pi}{3} \leq x \leq \frac{\pi}{3}$$

(a) Find the x coordinate of the turning point P on C , for which $x > 0$
Give your answer as a multiple of π .

(6)

(b) Find an equation of the normal to C at the point where $x = 0$

(3)

(Total 9 marks)