Product rule practice questions

Question 1

A curve, C, has equation

$$y = 3x^2e^x$$

(a) Find $\frac{dy}{dx}$, using the product rule for differentiation.

(b) Hence find the coordinates of the turning points of C.

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

(d) Determine the nature of each turning point of the curve C.

Question 2

(a) Differentiate $\ln x$ with respect to x.

(b) Given that $y = (9 + x)\ln x$, find $\frac{dy}{dx}$.

(c) Find an equation of the normal to the curve $y = (9 + x)\ln x$ at the point where $x = 1$

Question 3

A curve has equation $y = (x^2 - 24)e^x$.

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

(b) Find $\frac{d^2y}{dx^2}$.

(c) Find the x-coordinate of each of the stationary points of the curve.

(d) Using your answer to part (b), determine the nature of each of the stationary points.

Question 4

A curve, C, has equation

$$y = 7e^{2x}\tan x$$

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

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

Question 5

Find the exact gradient of the curve $y = x^4e^x$ at the point where $x = 2$.

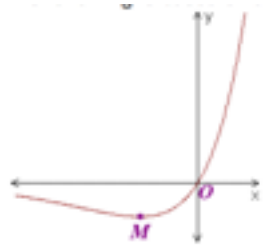
Question 6

Find the exact coordinates of the point on the curve $y = xe^{-\frac{1}{4}x}$ at which $\frac{d^2y}{dx^2} = 0$.

Question 7

Differentiate $x \cos 6x$ with respect to x.

Question 8



The diagram shows the curve $y = xe^{7x}$ and its minimum point M. Find the exact coordinates of M.

Question 9

A curve has equation $y = e^{2x}(x^2 - 2x - 11)$.

(a) Find the x-coordinates of each of the stationary points on the curve.

(b) Find $\frac{d^2y}{dx^2}$.

(a) Determine the nature of each of the stationary points on the curve.

Question 10

Given that $y = e^{2x} \sec 4x$, find $\frac{dy}{dx}$

Question 11

Differentiate $\sqrt{2 + 4x^2}$.

Hence show that the derivative of $x\sqrt{2 + 4x^2}$ is $\frac{2 + 8x^2}{\sqrt{2 + 4x^2}}$