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Differentiation: Products 4ii

A Level



Differentiate with respect to x , simplifying your answers where possible.

Part A $\sin x \tan x$

Differentiate $\sin x \tan x$.

The following symbols may be useful: x

Part B $x^2(x+1)^6$

Differentiate $x^2(x+1)^6$.

The following symbols may be useful: x

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Differentiation: Products 2ii

A Level



Given that $y = 4x^2 \ln x$, answer the following.

Part A First Derivative

Find an expression for $\frac{dy}{dx}$.

The following symbols may be useful: `Derivative(y, x)`, `ln()`, `log()`, `x`, `y`

Part B Second Derivative

Find the value of $\frac{d^2y}{dx^2}$, when $x = e^2$.

The following symbols may be useful: `Derivative(y, x, x)`, `ln()`, `log()`, `x`, `y`

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STEM SMART Single Maths 33 - The Product Rule & Implicit Differentiation

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Differentiation: Quotients 2ii

A Level



Differentiate with respect to x , simplifying your answers where possible.

Part A $\frac{\ln x}{x}$

$$y = \frac{\ln x}{x}$$

The following symbols may be useful: $\text{Derivative}(y, x)$, $\ln()$, $\log()$, x , y

Part B $\frac{x^2}{\ln x}$

$$y = \frac{x^2}{\ln x}$$

The following symbols may be useful: $\text{Derivative}(y, x)$, $\ln()$, $\log()$, x , y

Part C Stationary point of $y = \frac{x^2}{\ln x}$

Determine the exact x -coordinate of the stationary point of the curve $y = \frac{x^2}{\ln x}$.

The following symbols may be useful: e , $\ln()$, x

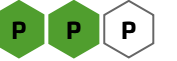


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Differentiation: Quotients 3i

A Level



A curve has equation $y = \frac{x^2+4}{x+2}$.

Part A Derivative

Find an expression for $\frac{dy}{dx}$ in terms of x .

The following symbols may be useful: `Derivative(y, x)`, `x`, `y`

Part B Normal

Find the equation of the normal to the curve at the point $(1, \frac{5}{3})$, giving your answer in the form $ax + by + c = 0$, where a , b , and c are integers.

The following symbols may be useful: `x`, `y`

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Differentiation: Products 1i

A Level

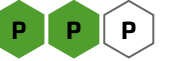


Figure 1 shows the curve with equation

$$x = (y + 4) \ln(2y + 3).$$

The curve crosses the x -axis at A and the y -axis at B .

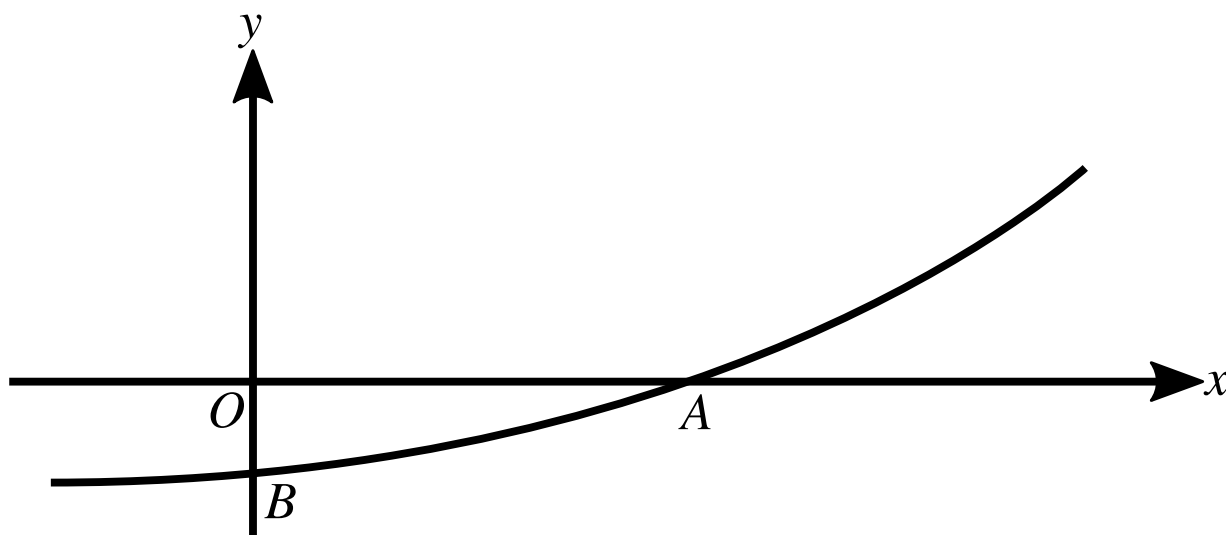


Figure 1: The curve $x = (y + 4) \ln(2y + 3)$.

Part A Derivative

Find an expression for $\frac{dx}{dy}$ in terms of y .

The following symbols may be useful: $\text{Derivative}(x, y)$, $\ln()$, $\log()$, x , y

Part B Gradients

Find the gradient of the curve at each of the points A and B , giving each answer correct to two decimal places.

Give the gradient at A .

Give the gradient at B .

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Implicit Differentiation 1

Pre-Uni Maths for Science J4.7

A Level Further A
P P P P P P

Part A Find $\frac{dy}{dx}$ if $x^2 + y^2 = r^2$.

Find $\frac{dy}{dx}$ if $x^2 + y^2 = r^2$, giving your answer as a simple function of x and y .

The following symbols may be useful: x , y

Part B Find gradient of tangent to $x^2 - xy + y^2 = 7$

Consider the curve $x^2 - xy + y^2 = 7$.

(i) Find as a function of x and y the gradient of the tangent to the curve $x^2 - xy + y^2 = 7$.

The following symbols may be useful: x , y

(ii) Using the equation for the gradient of the tangent to the curve $x^2 - xy + y^2 = 7$ from part (a) evaluate the slope at the point $(-1, 2)$.

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Differentiation: Products 4i

A Level



The equation of a curve has the form $y = e^{x^2}(ax^2 + b)$, where a and b are non-zero constants.

Part A First Derivative

Find an expression for $\frac{dy}{dx}$.

The following symbols may be useful: `Derivative(y, x)`, `a`, `b`, `e`, `ln()`, `log()`, `x`, `y`

Part B Second Derivative

Find an expression for $\frac{d^2y}{dx^2}$.

The following symbols may be useful: `Derivative(y, x, x)`, `a`, `b`, `e`, `ln()`, `log()`, `x`, `y`

Part C a in terms of b

It is given that $\frac{d^2y}{dx^2}$ can be expressed in the form $e^{x^2}(cx^4 + d)$, where c and d are non-zero constants.
Find an expression for a in terms of b .

The following symbols may be useful: `a`, `b`

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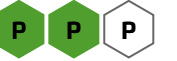


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Differentiation: Quotients 2i

A Level



Part A Derivative

Given that $y = \frac{4 \ln(x) - 3}{4 \ln(x) + 3}$, find an expression for $\frac{dy}{dx}$.

The following symbols may be useful: `Derivative(y, x)`, `ln()`, `log()`, `x`, `y`

Part B Gradient

Give the exact value of the gradient of the curve $y = \frac{4 \ln(x) - 3}{4 \ln(x) + 3}$ at the point where it crosses the x -axis.

The following symbols may be useful: `Derivative(y, x)`, `e`

Figure 1 shows part of the curve with equation

$$y = \frac{2}{x^{\frac{1}{2}}(4 \ln(x) + 3)}.$$

The region shaded in the diagram is bounded by the curve and the lines $x = 1$, $x = e$, and $y = 0$.

Find the exact value of the integral I where

$$I = \int_1^e \pi y^2 dx.$$

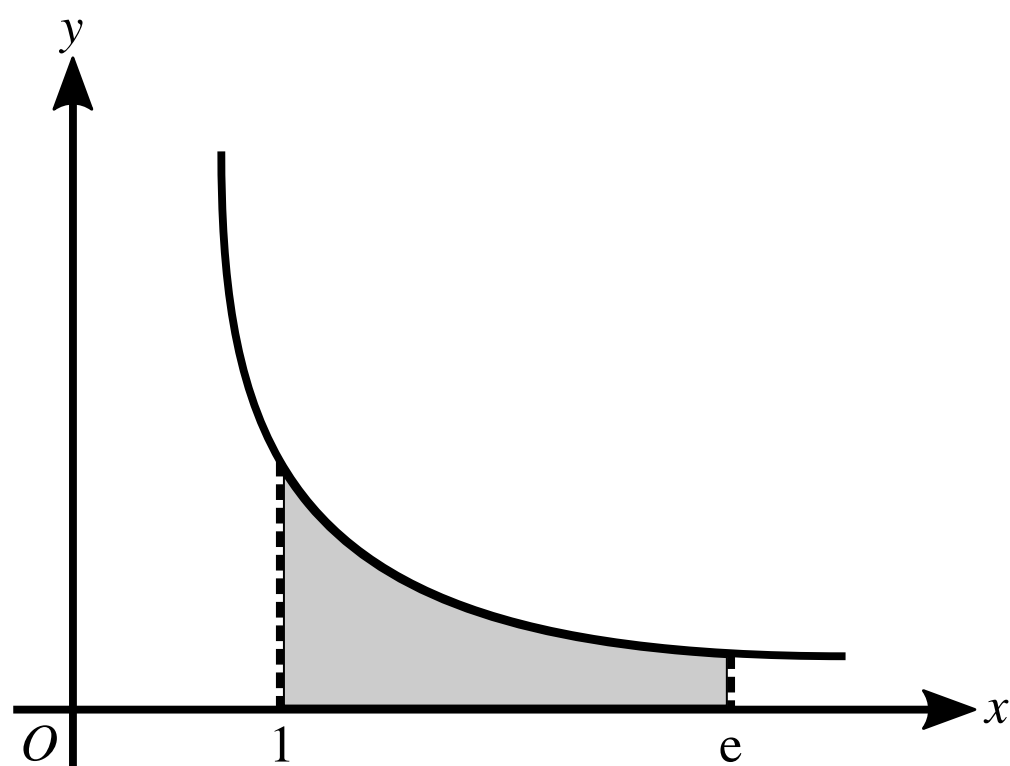


Figure 1: A diagram showing part of the curve with equation $y = \frac{2}{x^{\frac{1}{2}}(4 \ln(x)+3)}$.

Give the exact value of I .

The following symbols may be useful: I , π

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Calculus: Inverse Trigonometry 2i

Further A



Part A Derivative of $\arcsin x$

Find the derivative of $\arcsin x$

The following symbols may be useful: x

Part B Implicit differentiation

Given that

$$\arcsin 2x + \arcsin y = \frac{1}{2}\pi$$

find the exact value of $\frac{dy}{dx}$ when $x = \frac{1}{4}$.

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