Differentiating Powers 1

A Level Further A

Part A Differentiate $y = x^4$

Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ if $y = x^4$.

The following symbols may be useful: x

Part B Differentiate $x = t^2$

Find the gradient of the curve $x = t^2$ at the points $t = 0$, $t = 3$ and $t = -3$.

Find the gradient at $t = 0$.

Find the gradient at $t = 3$.

Find the gradient at $t = -3$.

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Differentiating Powers 2

A Level Further A

Part A Gradient of $v = \frac{1}{u}$

Find $\frac{\mathrm{d}v}{\mathrm{d}u}$ if $v = \frac{1}{u}$.

The following symbols may be useful: `u`

Part B Tangent to $v = \frac{1}{u}$

Find the equation of the tangent to this curve (i.e. $v = \frac{1}{u}$) at the point $u = 2$.

The following symbols may be useful: `u, v`

Part C Derivative of $F = Ar^3$

Find $\frac{\mathrm{d}F}{\mathrm{d}r}$ if $F = Ar^3$ where A is a constant.

The following symbols may be useful: `A, r`

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Differentiating Powers 3

A Level C C C Further A P P P

Part A Derivative of $v = Bu^{-3}$

Find $\frac{\mathrm{d}v}{\mathrm{d}u}$ if $v = Bu^{-3}$.

The following symbols may be useful: `B, u`

Part B Force if potential $V = \frac{q^2}{(4\pi\epsilon_0 r)}$

The electrostatic potential energy V of two equal charges q a distance r apart is given by $V = \frac{q^2}{(4\pi\epsilon_0 r)}$.

The force between the two charges is given by $-\frac{\mathrm{d}V}{\mathrm{d}r}$; find an expression for this force.

The following symbols may be useful: `epsilon_0, pi, q, r`

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Differentiating Powers 4

A Level Further A

Part A Gradient of curve $t = 4s^{-3/4}$

Find the gradient of the curve $t = 4s^{-3/4}$ at the point $s = 16$.

Part B First derivative of $x = bt^{3/2}$

Find $\frac{\mathrm{d}x}{\mathrm{d}t}$ if $x = bt^{3/2}$.

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

Part C Second derivative of $x = bt^{3/2}$

Find $\frac{\mathrm{d}^2x}{\mathrm{d}t^2}$ if $x = bt^{3/2}$.

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

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Differentiation (powers of x) 4i

A Level

Given that $f(x) = 8x^3 + \frac{1}{x^3}$,

Part A $f''(x)$

Find $f''(x)$.

The following symbols may be useful: x

Part B $f(x) = -9$

Give any of the solutions of the equation $f(x) = -9$.

The following symbols may be useful: x

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Differentiation (powers of x) 1ii

A Level

It is given that $y = 6x^3 + \frac{4}{\sqrt{x}} + 5x$.

Part A Find differential

Find $\frac{\mathrm{d}y}{\mathrm{d}x}$.

The following symbols may be useful: x

Part B Find second differential

Find $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$.

The following symbols may be useful: x

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