O Level A Maths Tutorial 12: Differentiation of trigonometric, exponential and logarithmic functions and their applications

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Syllabus :

• Derivatives of x^n, for any rational n, sin x, cos x, tan x, e^x, and ln x together with constant multiples, sums and differences

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1. Given

$$\frac{d}{dx}(\sin x)=\cos x$$

and

$$\frac{d}{dx}(\cos x)=-\sin x,$$

use the quotient rule rule to find

$$\frac{d}{dx}(\tan x).$$

2. Given $e = 2.718\ldots.$ (a constant like π)

and $$\frac{d}{dx}(e^x)=e^x .$$

(i) $y = e^{2x}$. Find $\frac{dy}{dx}$.

(ii) $z = xe^{2x}$. Find $\frac{dz}{dx}$.

3. Given $\ln x = \log_e x$,

and $\frac{d}{dx}(\ln x) = \frac{1}{x}$.

Find the derivative of $\ln 2x$ and $x \ln x$.

4. Find the derivatives of :

(i) $\sin^2 x$

(ii) $e^{-x} \cos x$

(iii) $x \ln x$