

MA 22000 Lesson 41 Notes
Section 4.5 (2nd half of text)
(Continuation of derivatives of logarithmic functions)

Reminder of rules of derivatives of logarithmic functions:

Derivative of the natural logarithmic function:

$$\frac{d}{dx}[\ln x] = \frac{1}{x} \quad (\text{In words, the derivative of a natural logarithmic function is its reciprocal.})$$

Let u be a function of x , then

$$\frac{d}{dx}[\ln u] = \frac{1}{u} \cdot u' \text{ or } \frac{1}{u} \cdot \frac{du}{dx} \quad (\text{reciprocal of argument times derivative of argument})$$

Example 1: Find the derivative of $y = (\ln x)^4$

Example 2: Find the derivative of $y = (\ln x^2)^3$

Example 3: Find the derivative of $y = x^4 \ln(2x)$

Example 4: Find f' if $f(x) = \frac{2\ln x}{x^4}$

Example 5: Find the derivative of g , where $f(x) = e^{2x} \ln(2x)$

Example 6: Find the equation of the tangent line to $y = x \ln(3x)$ at $(\frac{1}{3}, 0)$.

Example 7: Find the equation of the tangent line to $y = \frac{\ln x^2}{4x}$ at $\left(e, \frac{1}{2e}\right)$

Example 8: Find the equation of the tangent line to $f(x) = 2\ln x^3$ at the point $(e, 6)$