

Lecture 23

Thursday, October 10, 2024 10:07 PM

How to differentiate $\tan^3(e^{2x})$? We will use the chain rule twice.

$$\begin{aligned} [\tan^3(e^{2x})]' &= 3 \tan^2(e^{2x}) [\tan(e^{2x})]' = 3 \tan^2(e^{2x}) \sec^2(e^{2x}) (e^{2x})' \\ &= 3 \tan^2(e^{2x}) \sec^2(e^{2x}) 2e^{2x} \end{aligned}$$

$$\text{Ex: } (b^x)' = (e^{x \ln b})' = e^{x \ln b} (x \ln b)' = e^{x \ln b} \ln b = b^x \ln b$$

Implicit differentiation:

Suppose $y = y(x)$ and $f(x, y) = g(x, y)$ for all x .

We can differentiate both sides with respect to x :

$$\frac{d}{dx} [f(x, y)] = \frac{d}{dx} [g(x, y)]$$

Ex: find y' in terms of x and y , provided that

$$x^2 - 3xy + y^2 = 5$$

Find the tangent line to this ellipse at $(1, 4)$.

Ex: find y' in terms of x and y , provided that

$$2(x^2 + y^2)^2 = 25(x^2 - y^2)$$

Find the tangent line to this figure-8 at $(3, 1)$.

Use the command **ContourPlot** on Mathematica to graph an equation.