

An Example from Calculus

[your name here]

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1 Derivative of e^x

Theorem. *The derivative of e^x is e^x .*

Proof. Recall the Taylor expansion

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}.$$

Now, compute the derivative of the series termwise:

$$\begin{aligned} \frac{d}{dx}(e^x) &= \frac{d}{dx} \left(\sum_{n=0}^{\infty} \frac{x^n}{n!} \right) \\ &= \sum_{n=1}^{\infty} \frac{nx^{n-1}}{n!} \\ &= \sum_{n=1}^{\infty} \frac{x^{n-1}}{(n-1)!} \\ &= \sum_{n=0}^{\infty} \frac{x^n}{n!} \\ &= e^x \end{aligned}$$

□