

Calculus I, Section 3.4, #50  
The Chain Rule

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Find  $y'$  and  $y''$ .<sup>1</sup>

$$y = e^{e^x}$$

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$$\begin{aligned} y' &= e^{e^x} \cdot e^x \cdot 1 \\ &= e^{e^x} e^x \end{aligned}$$

so

$$\begin{aligned} y'' &= e^{e^x} \cdot \frac{d}{dx} [e^x] + e^x \cdot \frac{d}{dx} [e^{e^x}] \\ &= e^{e^x} e^x + e^x \cdot e^{e^x} e^x \\ &= e^{e^x} e^x + e^{2x} e^{e^x} \end{aligned}$$

or

$$\begin{aligned} &= e^{e^x} e^x (1 + e^x) \\ &= e^{e^x+x} (1 + e^x) \end{aligned}$$

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<sup>1</sup>Stewart, *Calculus, Early Transcendentals*, p. 204, #38.