

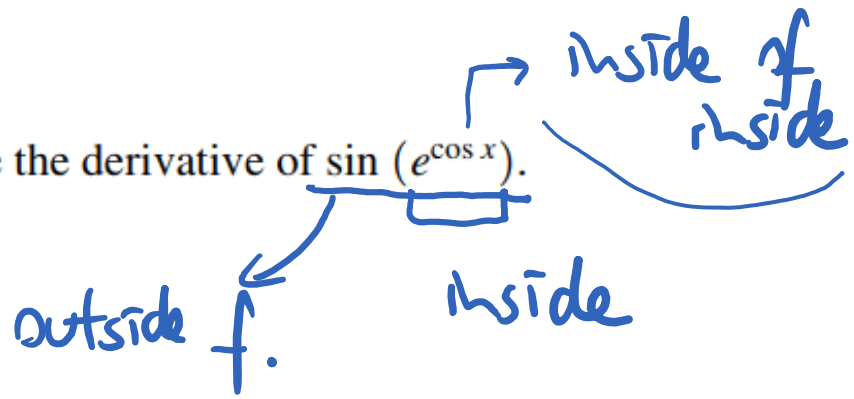
$$(e^x)' = e^x$$

$$(e^u)' = e^u \cdot \underline{u'}$$

The Composition of Three or More Functions

We can differentiate the composition of three or more functions by applying the Chain Rule repeatedly, as shown in the following example.

EXAMPLE 6 Composition of three functions Calculate the derivative of $\sin(e^{\cos x})$.



$$\frac{d}{dx} \left(\sin(e^{\cos x}) \right) = \left[\sin(e^{\cos x}) \right]'$$

$$= \cos(e^{\cos x}) \cdot e^{\cos x} \cdot (\cos x)'$$

$$= \cos(e^{\cos x}) \cdot e^{\cos x} \cdot (-\sin x)$$

no merging!

$$\cos(x) \cdot (x) \neq \cos(x^2)$$

$$\rightarrow x \cdot \cos x$$