

Derivatives of Exponentials Examples

Example 1.) $\frac{d}{dx} 3e^{x^2}$

$u = x^2, f = 3e^u, \frac{df}{du} \cdot \frac{du}{dx} = 3e^u(2x) = 6e^{x^2}x$

Example 2.) $\frac{d}{dx} \cosh t$

$\frac{1}{2}(e^x + e^{-x}) \times$ $\frac{d}{dx} \cosh t + (\cosh t)'t = \cosh t + (\sinh t)t$

Note: $\cosh x \rightarrow \sinh x$ (\underline{h} = hyperbolic)

Example 3.) $\frac{d}{dx} \left(\frac{2+e^{-2x}}{e^{3x}} \right)$

$\frac{(2+e^{-2x})(e^{3x}) - (e^{3x})'(2+e^{-2x})}{(e^{3x})^2} = \frac{e^{-2x} - e^{3x}(2+e^{-2x})}{(e^{3x})^2}$

(or use quotient & product rule)

$\frac{d}{dx} \left(\frac{2+e^{-2x}}{e^{3x}} \right) = \frac{d}{dx} (2+e^{-2x})(e^{-3x}) = (2+e^{-2x})(e^{-3x})' + (e^{-3x})'(2+e^{-2x})$
 $= (0 + (-2)(e^{-2x}))(e^{-3x}) + (-3e^{-3x})(2+e^{-2x})$
 $= -2e^{-5x} - 6e^{-5x} - 3e^{-5x} = -5e^{-5x} - 6e^{-5x}$