Today: Continuing Section 3.3 Derivatives of exponential and logarithmic functions

Example

Let \( f(x) = e^{2x} \)

\[ f(t) = e^{(-2t)} \cdot \cos(3t) \]

Consider graph of \( f \).

\[ \cos(3t) \]

- Amplitude: 1
- Period: \( \frac{2\pi}{3} \)

\[ e^t \]
So \( y = e^{-2t} \cos(3t) \) would look like this.

Now for the calculus: What is the derivative of \( f(t) = e^t e^{-2t} \cos(3t) \) ?

Solution: \( f'(t) = \left( \frac{d}{dt} e^{-2t} \right) \cdot \cos(3t) + e^{-2t} \cdot \left( \frac{d}{dt} \cos(3t) \right) \)

\[
= \left( -2 e^{-2t} \right) \cdot \cos(3t) + e^{-2t} \cdot (-3 \sin(3t))
\]

\[
= -e^{-2t} \left( 2 \cos(3t) + 3 \sin(3t) \right)
\]
\[= -e^{(-2t)} \left( \sqrt{13} \sin(3t + \theta) \right) \]

\[\theta = \tan^{-1}\left(\frac{3}{5}\right)\]

\[= -\sqrt{13} e^{(-2t)} \sin(3t + \theta)\]

amplitude: \(-\sqrt{13} e^{(-2t)}\)

period: \(\frac{2\pi}{3}\)

\([\text{End of Lecture}]\)