

Exercise 32

Find the limit or show that it does not exist.

$$\lim_{x \rightarrow \infty} (e^{-x} + 2 \cos 3x)$$

Solution

Use the limit laws.

$$\begin{aligned} \lim_{x \rightarrow \infty} (e^{-x} + 2 \cos 3x) &= \lim_{x \rightarrow \infty} e^{-x} + \lim_{x \rightarrow \infty} 2 \cos 3x \\ &= 0 + 2 \underbrace{\lim_{x \rightarrow \infty} \cos 3x}_{\text{does not exist}} \\ &= \text{does not exist} \end{aligned}$$

The limit does not exist because cosine does not approach a single value as its argument becomes infinite.