

Exercise 10Calculate y' .

$$y = e^{mx} \cos nx$$

SolutionCalculate y' by using the chain and product rules.

$$\begin{aligned} y' &= \frac{d}{dx}(e^{mx} \cos nx) \\ &= \left[\frac{d}{dx}(e^{mx}) \right] \cos nx + e^{mx} \left[\frac{d}{dx}(\cos nx) \right] \\ &= \left[(e^{mx}) \cdot \frac{d}{dx}(mx) \right] \cos nx + e^{mx} \left[(-\sin nx) \frac{d}{dx}(nx) \right] \\ &= [(e^{mx}) \cdot (m)] \cos nx + e^{mx} [(-\sin nx)(n)] \\ &= me^{mx} \cos nx - ne^{mx} \sin nx \\ &= e^{mx}(m \cos nx - n \sin nx) \end{aligned}$$