

Exercise 31

Find the derivative of the function.

$$F(t) = e^{t \sin 2t}$$

Solution

Take the derivative using the product rule and the chain rule twice.

$$\begin{aligned} F'(t) &= \frac{dF}{dt} = \frac{d}{dt} (e^{t \sin 2t}) \\ &= e^{t \sin 2t} \cdot \frac{d}{dt} (t \sin 2t) \\ &= e^{t \sin 2t} \cdot \left\{ \left[\frac{d}{dt} (t) \right] \sin 2t + t \left[\frac{d}{dt} (\sin 2t) \right] \right\} \\ &= e^{t \sin 2t} \cdot \left\{ (1) \sin 2t + t \left[(\cos 2t) \cdot \frac{d}{dt} (2t) \right] \right\} \\ &= e^{t \sin 2t} \cdot \{ \sin 2t + t [(\cos 2t) \cdot (2)] \} \\ &= e^{t \sin 2t} (\sin 2t + 2t \cos 2t) \end{aligned}$$