Exercise 7

Differentiate.

$$y = c\cos t + t^2 \sin t$$

Solution

Use the product rule to differentiate y.

$$\begin{aligned}
y' &= \frac{dy}{dt} \\
&= \frac{d}{dt}(c\cos t + t^2 \sin t) \\
&= \frac{d}{dt}(c\cos t) + \frac{d}{dt}(t^2 \sin t) \\
&= c\frac{d}{dt}(\cos t) + \left[\frac{d}{dt}(t^2)\right]\sin t + t^2\left[\frac{d}{dt}(\sin t)\right] \\
&= c(-\sin t) + (2t)\sin t + t^2(\cos t) \\
&= (2t - c)\sin t + t^2 \cos t
\end{aligned}$$