

Exercise 11Calculate y' .

$$y = \sqrt{x} \cos \sqrt{x}$$

SolutionCalculate y' by using the chain and product rules.

$$\begin{aligned} y' &= \frac{d}{dx} (\sqrt{x} \cos \sqrt{x}) \\ &= \left[\frac{d}{dx} (\sqrt{x}) \right] \cos \sqrt{x} + \sqrt{x} \left[\frac{d}{dx} (\cos \sqrt{x}) \right] \\ &= \left[\frac{d}{dx} (\sqrt{x}) \right] \cos \sqrt{x} + \sqrt{x} \left[(-\sin \sqrt{x}) \cdot \frac{d}{dx} (\sqrt{x}) \right] \\ &= \left(\frac{1}{2} x^{-1/2} \right) \cos \sqrt{x} + \sqrt{x} \left[(-\sin \sqrt{x}) \cdot \left(\frac{1}{2} x^{-1/2} \right) \right] \\ &= \left(\frac{1}{2\sqrt{x}} \right) \cos \sqrt{x} + \sqrt{x} \left[(-\sin \sqrt{x}) \cdot \left(\frac{1}{2\sqrt{x}} \right) \right] \\ &= \frac{\cos \sqrt{x}}{2\sqrt{x}} - \frac{\sqrt{x} \sin \sqrt{x}}{2\sqrt{x}} \\ &= \frac{\cos \sqrt{x} - \sqrt{x} \sin \sqrt{x}}{2\sqrt{x}} \end{aligned}$$