

**Example 7** Differentiate  $\sqrt{\tan \sqrt{x}}$  w.r.t.  $x$

**Solution** Let  $y = \sqrt{\tan \sqrt{x}}$ . Using **chain rule**, we have

$$\begin{aligned} \frac{dy}{dx} &= \frac{1}{2\sqrt{\tan \sqrt{x}}} \cdot \frac{d}{dx}(\tan \sqrt{x}) \\ &= \frac{1}{2\sqrt{\tan \sqrt{x}}} \cdot \sec^2 \sqrt{x} \frac{d}{dx}(\sqrt{x}) \\ &= \frac{1}{2\sqrt{\tan \sqrt{x}}} (\sec^2 \sqrt{x}) \left( \frac{1}{2\sqrt{x}} \right) \\ &= \frac{(\sec^2 \sqrt{x})}{4\sqrt{x}\sqrt{\tan \sqrt{x}}} \end{aligned}$$