



Differentiation Ex 11.6 Q4

Here,

$$y = \sqrt{\tan x + \sqrt{\tan x + \sqrt{\tan x + \dots \text{to } \infty}}}$$
$$y = \sqrt{\tan x + y}$$

Squaring both the sides,

$$y^2 = \tan x + y$$

Differentiating it with respect to  $x$ ,

$$2y \frac{dy}{dx} = \sec^2 x + \frac{dy}{dx}$$

$$\frac{dy}{dx} (2y - 1) = \sec^2 x$$

$$\frac{dy}{dx} = \frac{\sec^2 x}{2y - 1}$$

Differentiation Ex 11.6 Q5

Here,

$$y = (\sin x)^{(\sin x)^{\sin x}}$$

$$\Rightarrow y = (\sin x)^y$$

Taking log on both the sides,

$$\log y = \log (\sin x)^y$$

$$\log y = y (\log \sin x)$$

Differentiating it with respect to  $x$ , using product rule,

$$\frac{1}{y} \frac{dy}{dx} = y \frac{d}{dx} (\log \sin x) + \log \sin x \frac{dy}{dx}$$

$$\frac{1}{y} \frac{dy}{dx} = y \frac{1}{\sin x} \frac{d}{dx} (\sin x) + \log \sin x \frac{dy}{dx}$$

$$\frac{dy}{dx} \left( \frac{1}{y} - \log \sin x \right) = \frac{y}{\sin x} (\cot x)$$

$$\frac{dy}{dx} \left( \frac{1 - y \log \sin x}{y} \right) = y \cot x$$

$$\frac{dy}{dx} = \frac{y^2 \cot x}{(1 - y \log \sin x)}$$

Differentiation Ex 11.6 Q6

Here,

$$y = (\tan x)^{(\tan x)^{\tan x}}$$

$$y = (\tan x)^y$$

Taking log on both the sides,

$$\log y = \log (\tan x)^y$$

$$\log y = y \log \tan x$$

Differentiating with respect to  $x$  using product rule and chain rule,

$$\frac{1}{y} \frac{dy}{dx} = y \frac{d}{dx} \log \tan x + \log \tan x \frac{dy}{dx}$$

$$\frac{1}{y} \frac{dy}{dx} = \frac{y}{\tan x} \frac{d}{dx} (\tan x) + \log \tan x \frac{dy}{dx}$$

$$\frac{dy}{dx} \left( \frac{1}{y} - \log \tan x \right) = \frac{y}{\tan x} \sec^2 x$$

$$\left( \frac{dy}{dx} \right)_{x=\frac{\pi}{4}} = \frac{y \sec^2 \left( \frac{\pi}{4} \right)}{\tan \left( \frac{\pi}{4} \right) - y \log \tan \left( \frac{\pi}{4} \right)}$$

$$\left( \frac{dy}{dx} \right)_{\frac{\pi}{4}} = \frac{y^2 (\sqrt{2})^2}{1(1 - y \log \tan 1)}$$

$$= \frac{2(1)^2}{(1-0)}$$

$$\left( \frac{dy}{dx} \right)_{\frac{\pi}{4}} = 2$$

$$\left\{ \begin{array}{l} \text{since,} \\ \left( y \right)_{\frac{\pi}{4}} = \left( \tan \frac{\pi}{4} \right)^{\left( \tan \frac{\pi}{4} \right)^{\tan \frac{\pi}{4}}} \\ \Rightarrow y = (1)^1 \\ \Rightarrow y = 1 \end{array} \right\}$$

\*\*\*\*\* END \*\*\*\*\*