



Differentiation Ex 11.2 Q20

Let $y = \sin\left(\frac{1+x^2}{1-x^2}\right)$

Differentiate it with respect to x ,

$$\begin{aligned}\frac{dy}{dx} &= \frac{d}{dx} \left(\sin \left(\frac{1+x^2}{1-x^2} \right) \right) \\ &= \cos \left(\frac{1+x^2}{1-x^2} \right) \frac{d}{dx} \left(\frac{1+x^2}{1-x^2} \right) && \text{[Using chain rule]} \\ &= \cos \left(\frac{1+x^2}{1-x^2} \right) \left[\frac{(1-x^2) \frac{d}{dx} (1+x^2) - (1+x^2) \frac{d}{dx} (1-x^2)}{(1-x^2)^2} \right] && \text{[Using quotient rule]} \\ &= \cos \left(\frac{1+x^2}{1-x^2} \right) \left[\frac{(1-x^2)(2x) - (1+x^2)(-2x)}{(1-x^2)^2} \right] \\ &= \cos \left(\frac{1+x^2}{1-x^2} \right) \left[\frac{2x - 2x^3 + 2x + 2x^3}{(1-x^2)^2} \right] \\ &= \frac{4x}{(1-x^2)^2} \cos \left(\frac{1+x^2}{1-x^2} \right)\end{aligned}$$

So,

$$\frac{d}{dx} \left(\sin \left(\frac{1+x^2}{1-x^2} \right) \right) = \frac{4x}{(1-x^2)^2} \cos \left(\frac{1+x^2}{1-x^2} \right).$$

Differentiation Ex 11.2 Q21

Let $y = e^{3x} \cos 2x$

Differentiate it with respect to x ,

$$\begin{aligned}\frac{dy}{dx} &= \frac{d}{dx} (e^{3x} \cos 2x) \\ &= e^{3x} \times \frac{d}{dx} (\cos 2x) + \cos 2x \frac{d}{dx} (e^{3x}) && \text{[Using product rule]} \\ &= e^{3x} \times (-\sin 2x) \frac{d}{dx} (2x) + \cos 2x e^{3x} \frac{d}{dx} (3x) && \text{[Using chain rule]} \\ &= -2e^{3x} \sin 2x + 3e^{3x} \cos 2x \\ &= e^{3x} (3 \cos 2x - 2 \sin 2x)\end{aligned}$$

so,

$$\frac{d}{dx} (e^{3x} \cos 2x) = e^{3x} (3 \cos 2x - 2 \sin 2x).$$

Differentiation Ex 11.2 Q22

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

Differentiate it with respect to x ,

$$\begin{aligned}
 \frac{dy}{dx} &= \frac{d}{dx} \sin(\log \sin x) \\
 &= \cos(\log \sin x) \frac{d}{dx} (\log \sin x) && \text{[Using chain rule]} \\
 &= \cos(\log \sin x) \times \frac{1}{\sin x} \frac{d}{dx} \sin x \\
 &= \cos(\log \sin x) \frac{\cos x}{\sin x} \\
 &= \cos(\log \sin x) \times \cot x
 \end{aligned}$$

Hence,

$$\frac{d}{dx} \left(\sin(\log \sin x) \right) = \cos(\log \sin x) \times \cot x.$$

Differentiation Ex 11.2 Q23

Let $y = e^{\tan 3x}$

Differentiate it with respect to x ,

$$\begin{aligned}
 \frac{dy}{dx} &= \frac{d}{dx} \left(e^{\tan 3x} \right) \\
 &= e^{\tan 3x} \frac{d}{dx} (\tan 3x) && \text{[Using chain rule]} \\
 &= e^{\tan 3x} \times \sec^2 3x \times \frac{d}{dx} (3x) \\
 &=
 \end{aligned}$$

So,

$$\frac{d}{dx} \left(e^{\tan 3x} \right) = 3e^{\tan 3x} \times \sec^2 3x$$

Differentiation Ex 11.2 Q24

Let $y = e^{\sqrt{\cot x}}$

$$\Rightarrow y = e^{(\cot x)^{\frac{1}{2}}}$$

Differentiate it with respect to x ,

$$\begin{aligned}
 \frac{dy}{dx} &= \frac{d}{dx} \left(e^{(\cot x)^{\frac{1}{2}}} \right) \\
 &= e^{(\cot x)^{\frac{1}{2}}} \times \frac{d}{dx} (\cot x)^{\frac{1}{2}} && \text{[Using chain rule]} \\
 &= e^{\sqrt{\cot x}} \times \frac{1}{2} (\cot x)^{\frac{1}{2}-1} \frac{d}{dx} (\cot x) \\
 &= - \frac{e^{\sqrt{\cot x}} \times \operatorname{cosec}^2 x}{2\sqrt{\cot x}}
 \end{aligned}$$

So,

$$\frac{d}{dx} \left(e^{\sqrt{\cot x}} \right) = - \frac{e^{\sqrt{\cot x}} \times \operatorname{cosec}^2 x}{2\sqrt{\cot x}}$$

***** END *****