Differentiation Ex 11.2 Q34

Let $\quad y = e^{\sin^{-1} 2x}$

Differentiate it with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(e^{\sin^{-1} 2x}\right)$$

$$= e^{\sin^{-1} 2x} \times \frac{d}{dx}\left(\sin^{-1} 2x\right) \qquad \text{[Using chain rule]}$$

$$= e^{\sin^{-1} 2x} \times \frac{1}{\sqrt{1-(2x)^2}} \frac{d}{dx}(2x)$$

$$= \frac{2e^{\sin-1}2x}{\sqrt{1-4x^2}}$$

So,

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

Differentiation Ex 11.2 Q35

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

Differentiate it with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(\sin\left(2\sin^{-1} x\right)\right)$$

$$= \cos\left(2\sin^{-1} x\right) \frac{d}{dx}\left(2\sin^{-1} x\right) \qquad \text{[Using chain rule]}$$

$$= \cos\left(2\sin^{-1} x\right) \times 2 \frac{1}{\sqrt{1-x^2}}$$

$$= \frac{2\cos\left(2\sin^{-1} x\right)}{\sqrt{1-x^2}}$$

So,

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

Differentiation Ex 11.2 Q36

Let $\quad y = e^{\tan^{-1}\sqrt{x}}$

Differentiate it with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(e^{\tan^{-1}}\sqrt{x}\right)$$

$$= e^{\tan^{-1}\sqrt{x}} \frac{d}{dx}\left(\tan^{-1}\sqrt{x}\right) \qquad \text{[Using chain rule]}$$

$$= e^{\tan^{-1}\sqrt{x}} \times \frac{1}{1+\left(\sqrt{x}\right)^2} \frac{d}{dx}\left(\sqrt{x}\right)$$

$$= \frac{e^{\tan^{-1}\sqrt{x}}}{1+x} \times \frac{1}{2\sqrt{x}}$$

$$= \frac{e^{\tan-1}\sqrt{x}}{2\sqrt{x}\,(1+x)}$$

So,

$$\frac{d}{dx}\left(e^{\tan-1}\sqrt{x}\right) = \frac{e^{\tan^{-1}\sqrt{x}}}{2\sqrt{x}\,(1+x)}.$$

Differentiation Ex 11.2 Q37

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

$\Rightarrow \quad y = \left(\tan^{-1}\left(\frac{x}{2}\right)\right)^{\frac{1}{2}}$

Differentiate with respect to x,

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

$$= \frac{1}{2}\left(\tan^{-1}\frac{x}{2}\right)^{\frac{1}{2}-1}\frac{d}{dx}\left(\tan^{-1}\frac{x}{2}\right) \qquad \text{[Using chain rule]}$$

$$= \frac{1}{2}\left(\tan^{-1}\frac{x}{2}\right)^{\frac{-1}{2}} \times \frac{1}{1+\left(\frac{x}{2}\right)^2} \times \frac{d}{dx}\left(\frac{x}{2}\right)$$

$$= \frac{4}{4\sqrt{\tan^{-1}\left(\frac{x}{2}\right)}\left(4+x^2\right)}$$

$$= \frac{1}{\left(4+x^2\right)\sqrt{\tan^{-1}\left(\frac{x}{2}\right)}}$$

So,

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

Differentiation Ex 11.2 Q38

Let $y = \log\left(\tan^{-1}x\right)$

Differentiate with respect to x, .

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

$$= \frac{1}{\tan^{-1}x} \times \frac{d}{dx}\left(\tan^{-1}x\right) \qquad \text{[Using chain rule]}$$

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

So,

$$\frac{d}{dx}\left(\log\tan^{-1}x\right) = \frac{1}{\left(1+x^2\right)\tan^{-1}x}.$$

*********** END **********