Differentiation Ex 11.2 Q20

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

Differentiate it with respect to x,

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

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

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

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

$$= \cos\left(\frac{1+x^2}{1-x^2}\right)\left[\frac{2x-2x^3+2x+2x^3}{\left(1-x^2\right)^2}\right]$$

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

So,

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

Differentiation Ex 11.2 Q21

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

Differentiate it with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\left(e^{3x}\cos 2x\right)$$

$$= e^{3x}\times\frac{d}{dx}(\cos 2x)+\cos 2x\,\frac{d}{dx}\left(e^{3x}\right) \qquad \text{[Using product rule]}$$

$$= e^{3x}\times(-\sin 2x)\,\frac{d}{dx}(2x)+\cos 2x e^{3x}\,\frac{d}{dx}(3x) \qquad \text{[Using chain rule]}$$

$$= -2e^{3x}\sin 2x + 3e^{3x}\cos 2x$$

$$= e^{3x}(3\cos 2x - 2\sin 2x)$$

so,

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

Differentiation Ex 11.2 Q22

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

Differentiate it with respect to x,

$$\frac{dy}{dx} = \frac{d}{dx}\sin(\log\sin x)$$
$$= \cos(\log\sin x)\frac{d}{dx}(\log\sin x) \qquad \text{[Using chain rule]}$$
$$= \cos(\log\sin x)\times\frac{1}{\sin x}\frac{d}{dx}0\sin x$$
$$= \cos(\log\sin x)\frac{\cos x}{\sin x}$$
$$= \cos(\log s\,\sin x)\times\cot x$$

Hence,

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

Differentiation Ex 11.2 Q23

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

Differentiate it with respect to x,

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

So,

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

Differentiation Ex 11.2 Q24

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

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

Differentiate it with respect to x,

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

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 **********