



Differentiation Ex 11.2 Q11

Let, $y = 3^{e^x}$

Differentiate it with respect to x ,

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

So,

$$\frac{d}{dx} \left(3^{e^x} \right) = e^x \times 3^{e^x} \log 3.$$

Differentiation Ex 11.2 Q12

Let $y = \log_x 3$

$$\Rightarrow y = \frac{\log 3}{\log x} \quad \left[\text{Since, } \log_a b = \frac{\log b}{\log a} \right]$$

Differentiate with respect to x ,

$$\begin{aligned}\frac{dy}{dx} &= \frac{d}{dx} \left(\frac{\log 3}{\log x} \right) \\ &= \log 3 \frac{d}{dx} (\log x)^{-1} \\ &= \log 3 \times \left[-1 (\log x)^{-2} \right] \frac{d}{dx} (\log x) \quad \text{[Using chain rule]} \\ &= - \frac{\log 3}{(\log x)^2} \times \frac{1}{x} \\ &= - \left(\frac{\log 3}{\log x} \right)^2 \times \frac{1}{x} \times \frac{1}{\log 3} \\ &= - \frac{1}{x \log 3 (\log_3 x)^2} \quad \left[\text{Since, } \frac{\log b}{\log a} = \log_a b \right]\end{aligned}$$

So,

$$\frac{d}{dx} (\log_x 3) = - \frac{1}{x \log 3 (\log_3 x)^2}.$$

Differentiation Ex 11.2 Q13

Let $y = 3^{x^2+2x}$

Differentiate with respect to x ,

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

So,

$$\frac{d}{dx} \left(3^{x^2+2x} \right) = (2x + 2) \log 3 \times 3^{x^2+2x}.$$

Differentiation Ex 11.2 Q14

$$\text{Let } y = \sqrt{\frac{a^2 - x^2}{a^2 + x^2}}$$

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

Differentiate with respect to x ,

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

So,

$$\frac{d}{dx} \left(\sqrt{\frac{a^2 - x^2}{a^2 + x^2}} \right) = \frac{-2a^2x}{\sqrt{a^2 - x^2} (a^2 + x^2)^{\frac{3}{2}}}.$$

Differentiation Ex 11.2 Q15

$$\text{Let } y = 3^{x \log x}$$

Differentiate with respect to x ,

$$\begin{aligned} \frac{dy}{dx} &= \frac{d}{dx} (3^{x \log x}) \\ &= 3^{x \log x} \times \log 3 \frac{d}{dx} (x \log x) && \text{[Using chain rule]} \\ &= 3^{x \log x} \times \log 3 \left[x \frac{d}{dx} (\log x) + \log x \frac{d}{dx} (x) \right] && \text{[Using chain rule]} \\ &= 3^{x \log x} \times \log 3 \left[\frac{x}{x} + \log x \right] \\ &= 3^{x \log x} (1 + \log x) \times \log 3 \end{aligned}$$

So,

$$\frac{d}{dx} (3^{x \log x}) = \log 3 \times 3^{x \log x} (1 + \log x).$$

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