Exercise 5.4

Differentiate the following functions with respect to x (তলৰ ফলনসমূহ x ৰ সাপেক্ষে অৱকলজ কৰা) :

1. $\frac{e^x}{sinx}$

Solution : ধৰাহ'ল, y = $\frac{e^x}{sinx}$

$\therefore \quad \frac{dy}{dx} = \frac{d}{dx}\left(\frac{e^x}{sinx}\right)$

$= \frac{sinx.\frac{d}{dx}(e^x) - e^x.\frac{d}{dx}(sinx)}{(sinx)^2}$ $\quad \left[\because \left(\frac{u}{v}\right)' = \frac{u'v - uv'}{v^2}\right]$

$= \frac{sinx.e^x - e^x.cosx}{\sin^2 x}$

$= \frac{e^x(sinx - cosx)}{\sin^2 x}$ Answer

2. $e^{\sin^{-1}x}$

Solution : ধৰাহ'ল, y = $e^{\sin^{-1}x}$

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

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

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

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

3. e^{x^3}

Solution : ধৰাহ'ল, y = e^{x^3}

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

$= e^{x^3}.\frac{\mathrm{d}}{\mathrm{dx}}(\mathrm{x}^3)$ $\quad \left[\because \frac{d}{dx}(e^{mx}) = e^{mx}.\frac{d}{dx}(mx) = me^{mx}\right]$

$= e^{x^3}.3\mathrm{x}^2$

$= 3x^2e^{x^3}$ Answer

4. $sin(\tan^{-1} e^{-x})$

Solution : ধৰাহ'ল, $\mathrm{y} = sin(\tan^{-1} e^{-x})$

$\therefore \quad \frac{dy}{dx} = \frac{d}{dx}\{sin(\tan^{-1} e^{-x})\}$

$= \{cos(\tan^{-1} e^{-x})\}.\frac{\mathrm{d}}{\mathrm{dx}}(\tan^{-1}\mathrm{e}^{-\mathrm{x}})$ $\quad \left[\because \frac{d}{dx}(sinmx) = cosmx.\frac{d}{dx}(mx) = mcosmx\right]$

$= \{cos(\tan^{-1} e^{-x})\}.\frac{1}{1+(\mathrm{e}^{-\mathrm{x}})^2}.\frac{d}{dx}(\mathrm{e}^{-\mathrm{x}})$

$= \left\{cos\left(\tan^{-1} e^{-x}\right)\right\}.\frac{1}{1+\mathrm{e}^{-2\mathrm{x}}}.(-\mathrm{e}^{-\mathrm{x}})$ $\quad \left[\because \frac{d}{dx}(e^{-x}) = -e^{-x}\right]$

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

5. $log(cose^x)$

Solution : ধৰাহ'ল, $\mathrm{y} = log(cose^x)$

$\therefore \quad \frac{dy}{dx} = \frac{d}{dx}\{log(cose^x)\}$

$= \frac{1}{cose^x}.\frac{d}{dx}(cose^x)$ $\quad \left[\because \frac{d}{dx}(logmx) = \frac{1}{mx}\frac{d}{dx}(mx)\right]$

$= \frac{1}{cose^x}.(-sine^x).\frac{d}{dx}(e^x)$

$= -tane^x.e^x$

$= -e^xtane^x$ Answer

A Few Home Works :

Find $\frac{dy}{dx}$ of the following functions :

1. $y = \sin(ax^2 + bx + c)$
2. $y = \tan(\sin 2x)$
3. $y = \sqrt{x^n}$
4. $y = cos\sqrt{kx}$
5. $y = \frac{ax^3}{\sqrt{x}}$
6. $y = \frac{ax^4}{b\sqrt[5]{x}}$
7. $y = \sqrt[n]{x^7}$
8. $y = 2\sqrt{tan(ax)}$
9. $y = sin\{cos(x^3)\}$
10. $y = \frac{sin(ax+b)}{cos(mx+n)}$

(i) Write your Name and Roll No. in the front page of your Answerscript.

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(ii) Send your Answerscript (containing the solutions of the above questions) to my Email : mridulkrgogoi@gmail.com

[তোমালোকৰ উত্তৰ বহী সমূহ মোৰ Email ত পঠাই দিবা]