Assignment for class XII

General Directions For Students :Whatever be the notes provided , everything must be copied in the maths copy and then do the homework in the same copy

Topic : Implicit Differentiation

Chapter 5: Exercise 5.8

- An Implicit equation is an equation which is not in the form of y= f(x)
- It consists of two variables x and y which cannot be separated.
- Implicit functions are differemtiated by using "chain rule " in combination with" product and quotient rule "
- When we differentiate y we write $\frac{dy}{dx}$ with the derivative. (i.e. $\frac{d}{dx}\left(y^2\right)=2y\frac{dy}{dx}$.)
- To find the derivative of the product of x and y i.e. $\frac{d}{dx}\left(xy\right)$ we use produt rule

Q.3.ii) Find $\frac{dy}{dx}$ if $x^3+x^2y+xy^2+y^3=81$

solution. $\frac{d}{dx}\left(x^3\right)+x^2\frac{d}{dx}\left(y\right)+y\frac{d}{dx}\left(x^2\right)+x\frac{d}{dx}\left(y^2\right)+y^2\frac{d}{dx}\left(x\right)+\frac{d}{dx}\left(y^3\right)=\frac{d}{dx}\left(81\right)$

$\Rightarrow 3x^2+x^2\frac{dy}{dx}+2xy+x\left(2y\right)\frac{dy}{dx}+y^2+3y^2\frac{dy}{dx}=0$

$\Rightarrow \left(x^2+2xy+3y^2\right)\frac{dy}{dx}+\left(3x^2+2xy+y^2\right)=0$

$\Rightarrow \left(x^2+2xy+3y^2\right)\frac{dy}{dx}=-\left(3x^2+2xy+y^2\right)$

$\Rightarrow \frac{dy}{dx}=-\frac{3x^2+2xy+y^2}{x^2+2xy+3y^2}$

Q.5.ii) Find $\frac{dy}{dx}$ if $\sin\left(x+y\right)=\frac{2}{3}$

If $\sin\left(x+y\right)=\frac{2}{3}$ then $x+y=\sin^{-1}\frac{2}{3}$

$\Rightarrow \frac{d}{dx}\left(x+y\right)=\frac{d}{dx}(\sin^{-1}\frac{2}{3})$

$$\Rightarrow 1+\frac{dy}{dx}=0$$

$$\Rightarrow \frac{dy}{dx}=-1$$

Q.6. If $x^{\frac{2}{3}}+y^{\frac{2}{3}}=2,\ find\ \frac{dy}{dx}\ at\ (1,1)$

$$\frac{d}{y}(x^{\frac{2}{3}}+y^{\frac{2}{3}})=\frac{d}{dy}(2)$$

$$\Rightarrow \frac{d}{dy}(x^{\frac{2}{3}})+\frac{d}{dy}(y^{\frac{2}{3})}=0$$

$$\Rightarrow \frac{2}{3}x^{-\frac{1}{3}}+\frac{2}{3}y^{-\frac{1}{3}}\frac{dy}{dx}=0$$

$$\Rightarrow \frac{dy}{dx}=-\frac{\frac{2}{3}x^{-\frac{1}{3}}}{\frac{2}{3}y^{-\frac{1}{3}}}=\frac{1^{-\frac{1}{3}}}{1^{-\frac{1}{3}}}=-1 \qquad (\because x=1, y=1)$$

Q.8vi)Find $\frac{dy}{dx}$,when $y=\tan(x+y)$

$$\frac{dy}{dx}=\frac{d}{d(x+y)}\left(\tan(x+y)\right)\frac{d}{dx}(x+y)$$

$$\Rightarrow \frac{dy}{dx}=\sec^2(x+y)\frac{d}{dx}(x+y)$$

$$\Rightarrow \frac{dy}{dx}=\sec^2(x+y)\left(1+\frac{dy}{dx}\right)$$

$$\Rightarrow \frac{dy}{dx}=\sec^2(x+y)+\sec^2(x+y)\frac{dy}{dx}$$

$$\Rightarrow \frac{dy}{dx}-\sec^2(x+y)\frac{dy}{dx}=\sec^2(x+y)$$

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

$$\Rightarrow -\tan(x+y)^2\frac{dy}{dx}=\sec^2(x+y)$$

$$\Rightarrow \frac{dy}{dx} = -\frac{\sec^2(x+y)}{\tan^2(x+y)} = -\cos ec^2(x+y)$$

$$\Rightarrow \frac{dy}{dx} = -\cos ec^2(x+y)$$

Homework:

Q.2.i), 4.i),5.i)Q.7.ii),Q.8.v).8.viii)Q.10.ii).Q.11.iii)

Solution of following questions are discussed in the video link provided to you with this assignment:

Q7.i),Q.8.iii),vii),Q.9),Q.10i),iii),Q.11i)