# Open Mind Guruji

## Function: Lecture 02

Q. 10. $f(x) = 3x^4 + x^2 + 5 - 3\cos x + 2\sin^2 x$

Prove that $f(x) + f(-x) = 2f(x)$

$\Rightarrow$ given

$f(x) = 3x^4 + x^2 + 5 - 3\cos x + 2\sin^2 x$ — (1)

Put $x = -x$ in eq (1)

$f(-x) = 3(-x)^4 + (-x)^2 + 5 - 3\cos(-x) + 2\sin^2(-x)$

$\boxed{\sin(-\theta) = -\sin\theta}$ $[\cos(-\theta) = \cos\theta]$

$= 3.x^4 + x^2 + 5 - 3\cos(x) + 2[\sin(-x)]^2$

$= 3x^4 + x^2 + 5 - 3\cos x + 2[-\sin x]^2$

$= 3x^4 + x^2 + 5 - 3\cos x + 2[\sin x]^2$

$f(-x) = 3x^4 + x^2 + 5 - 3\cos x + 2\sin^2 x$ — (2)

$L.H.S = f(x) + f(-x)$

$= 3x^4 + x^2 + 5 - 3\cos x + 2\sin^2 x + 3x^4 + x^2 + 5 - 3\cos x + 2\sin^2 x$ (from eq (1) & eq (2))

$= 2[3x^4 + x^2 + 5 - 3\cos x + 2\sin^2 x]$

$L.H.S = 2.[f(x)]$ (from eq No. 1)

$\therefore$ $\boxed{L.H.S = R.H.S}$

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Q.13. $f(x) = \sin x$

Show that

$f(3x) = 3[f(x)] - 4f^3(x)$

$\rightarrow$ given

$f(x) = \sin x$ — (1)

Put $x = 3x$ in eq (1)

$f(3x) = \sin(3x)$

$\boxed{\sin 3\theta = 3\sin\theta - 4\sin^3\theta}$

$= 3\sin x - 4\sin^3 x$

$= 3\sin x - 4(\sin x)^3$

put $\sin x = f(x)$ [from eq (1)]

$f(3x) = 3f(x) - 4[f(x)]^3$

$f(3x) = 3f(x) - 4f^3(x)$

$\boxed{L.H.S = R.H.S}$