Q39

$4\boxed{\cos^2 x}\cdot \sin x - 2\sin^2 x = 2\sin x$

$4(1-\sin^2 x)\cdot \sin x - 2\sin^2 x = 2\sin x$

$4\sin x - 4\sin^3 x - 2\sin^2 x - 2\sin x = 0$

$2\sin x - 4\sin^3 x - 2\sin^2 x = 0$

$2\sin x\,(1 - 2\sin^2 x - \sin x) = 0$

$\sin x = 0$ OR $2\sin^2 x + \sin x - 1 = 0 \rightarrow (2\sin x - 1)(\sin x + 1) = 0$

$\boxed{x = n\pi}$

$\sin x = \frac{-1 \pm \sqrt{1+8}}{4}$ → $\frac{-1+3}{4} = \frac{1}{2}$; $\frac{-1-3}{4} = -1$

$\sin x = \frac{1}{2} = \sin\frac{\pi}{6}$

$x = n\pi + (-1)^n \cdot \frac{\pi}{6}$ | $\sin x = -1$

$x = 2n\pi - \frac{\pi}{2}$

Q40 $\sin 3x = 1 - \cos 2x$

$3\sin x - 4\sin^3 x = 2\sin^2 x$

$4\sin^3 x + 2\sin^2 x - 3\sin x = 0$

$\sin x\{4\sin^2 x + 2\sin x - 3\} = 0$

$\sin x = 0$ or $\sin x = \frac{-2 \pm \sqrt{4+48}}{8}$

$x = n\pi$

$= \frac{-2 \pm 2\sqrt{13}}{8}$ → $\frac{-1+\sqrt{13}}{4} = \frac{2.6}{4}$; $\frac{-1-\sqrt{13}}{4} = \frac{-1-3.6}{4} = -\frac{4.6}{4}$ ✗

$\sin x = -1.1$

$\sqrt{16} = 4$

$\sqrt{13} \approx 3.6$

$\sin x = \frac{\sqrt{13}-1}{4}$

$x = n\pi + (-1)^n \cdot \sin^{-1}\left(\frac{\sqrt{13}-1}{4}\right)$

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Q41

$2\cos 2x+\sqrt{2\sin x}=2$

$\sqrt{2\sin x}=2-2\cos 2x$

$=2(1-\cos 2x)$

$\sqrt{2\sin x}=2(2\sin^2 x)$

$\sqrt{2\sin x}-4\sin^2 x=0$

$\sqrt{2}\sqrt{\sin x}\left(1-2\sqrt{2}\sin^{3/2}x\right)=0$

$\sqrt{\sin x}=0$ OR $1-\left(\sqrt{2\sin x}\right)^3=0$

$\sin x=0$ $\qquad$ $\left(\sqrt{2\sin x}\right)^3=1$

$x=n\pi$

$\sqrt{2\sin x}=1\Rightarrow 2\sin x=1$

$\sin x=\frac{1}{2}=$

Q $\quad \sin^6 x+\cos^6 x=\frac{7}{16}$

$1-3\sin^2 x\cdot\cos^2 x=\frac{7}{16}$

$\cancel{3}\sin^2 x\cdot\cos^2 x=1-\frac{7}{16}=\frac{9}{16}$ 3

$16\sin^2 x\cdot\cos^2 x=3.$

$4(2\sin x\cdot\cos x)^2=3$

$(\sin 2x)^2=\frac{3}{4}=\left(\frac{\sqrt{3}}{2}\right)^2$

$\sin^2(2x)=\sin^2\frac{\pi}{3}.$

$2x=n\pi\pm\frac{\pi}{3}.$

$x=\frac{n\pi}{2}\pm\frac{\pi}{6}$

44 Adv

$(\sin^4 x+\cos^4 x)^2-2\sin^4 x\cos^4 x$

$=\frac{17}{16}\cos^2 2x$

45)* $2\sin^3 x + 2 = \cos^2 3x$

$2\sin^3 x + 2 = 1 - \sin^2 3x$

$2\sin^3 x + \sin^2(3x) + 1 = 0$

$2\sin^3 x + (3\sin x - 4\sin^3 x)^2 + 1 = 0$

↓

open & Hit & trial

$\sin x = 0, 1, -1$

Q46)* $\cos 4x = \cos^2(3x)$ $\quad \cos 2\theta = 2\cos^2\theta - 1$

$2\cos^2(2x) - 1 = \cos^2(3x)$

$\underbrace{2\cos^2(\overset{=1}{2x})}_{\leq 2} = 1 + \underbrace{\boxed{\cos^2(3x)}}_{\cos(3x) = 1}$

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$\underline{\underline{T_4}}$ ** Solving T. Eqⁿ by Introducing Auxilliary Argument

$a\cos\theta + b\sin\theta = c$ type Qs.

① Aux. Argument $= \sqrt{a^2+b^2}$

② $\boxed{\dfrac{a}{\sqrt{a^2+b^2}}}\cos\theta + \dfrac{b}{\sqrt{a^2+b^2}}\sin\theta = \dfrac{c}{\sqrt{a^2+b^2}} \longrightarrow \sin\phi\cdot\cos\theta + \cos\phi\cdot\sin\theta = \dfrac{c}{\sqrt{a^2+b^2}}$

$\Rightarrow \sin(\phi+\theta) = \dfrac{c}{\sqrt{a^2+b^2}} = \sin\alpha.$

Now solve

let $\sin\phi = \dfrac{a}{\sqrt{a^2+b^2}}$

$\cos\phi = \sqrt{1-\sin^2\phi} = \sqrt{1-\dfrac{a^2}{a^2+b^2}} = \sqrt{\dfrac{a^2+b^2-a^2}{a^2+b^2}}$

$\cos\phi = \dfrac{b}{\sqrt{a^2+b^2}}$

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$a\cos\theta + b\sin\theta = c$

Q1 Solve $\sin x + \cos x = \sqrt{2}$

$a = ?$ $b = ?$

$a = 1 = b$

① A.A $= \sqrt{a^2+b^2}$
$= \sqrt{1^2+1^2} = \sqrt{2}$

① $\dfrac{\sin x + \cos x = \sqrt{2}}{\sqrt{2}}$

② $\frac{1}{\sqrt{2}}\sin x + \frac{1}{\sqrt{2}}\cos x = 1$

1) Ise Sin या Cos Dono me Bdla Ja Skta hai

2nd But Cos me Ans dena Aasaan hota hai

$\rightarrow$ Constant $\frac{c}{\sqrt{a^2+b^2}}$ should be in betn $[-1, 1]$

$\cos x \cdot \cos\frac{\pi}{4} + \sin x \cdot \sin\frac{\pi}{4} = 1$

$\cos\left(x - \frac{\pi}{4}\right) = 1$

$x - \frac{\pi}{4} = 2n\pi$

$$\boxed{x = 2n\pi + \frac{\pi}{4}}$$

Q Solve

$\sin x + \cos x = 2$

① A.A $= \sqrt{1^2+1^2} = \sqrt{2}$

② $\sqrt{2}$ से divide.

$\frac{1}{\sqrt{2}}\sin x + \frac{1}{\sqrt{2}}\cos x = \sqrt{2}$

$\cos\left(x - \frac{\pi}{4}\right) = \sqrt{2} = 1.414$

$\times$

Sorry Bhai

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$a\cos\theta + b\sin\theta = c$

Q $\sqrt{3}\cos x + \sin x = 2$ Solve.

$\frac{\sqrt{3}}{2}\cos x + \frac{1}{2}\sin x = \frac{2}{2}$

$\cos x \cdot \cos\frac{\pi}{6} + \sin x \cdot \sin\frac{\pi}{6} = 1$

$\cos\left(x - \frac{\pi}{6}\right) = 1$

$x - \frac{\pi}{6} = 2n\pi$

$x = 2n\pi + \frac{\pi}{6}$

$a = \sqrt{3},\ b = 1$

(1) $A.A. = \sqrt{3+1}$

$= 2$

(2) 2 से dvd.

(3) $-1 \le \frac{c}{\sqrt{a^2+b^2}} \le 1$

Extra Shot

for $a\cos\theta + b\sin\theta = c$

(1) answer is possible only when $-1 \le \frac{c}{\sqrt{a^2+b^2}} \le 1$

(2) $\theta = 2n\pi \pm \cos^{-1}\frac{c}{\sqrt{a^2+b^2}} + \tan^{-1}\frac{b}{a}$

या

$\theta = n\pi + (-1)^n \sin^{-1}\frac{c}{\sqrt{a^2+b^2}} - \tan^{-1}\frac{a}{b}$

Q $\sqrt{3}\cos x + \sin x = 2$

$a = \sqrt{3},\ b = 1,\ c = 2$

$\sqrt{a^2+b^2} = 2$

(1) $x = 2n\pi \pm \cos^{-1}\frac{2}{2} + \tan^{-1}\frac{1}{\sqrt{3}}$

$\cos\theta$ में 1 कब आता है

$\tan\theta$ में $\frac{1}{\sqrt{3}}$ कब आता है।

$= 2n\pi \pm 0 + \frac{\pi}{6} \Rightarrow x = 2n\pi + \frac{\pi}{6}$

(2) $x = n\pi + (-1)^n \sin^{-1}\frac{2}{2} - \tan^{-1}\frac{\sqrt{3}}{1}$

tan me $\sqrt{3}$ kb aata hai

$= n\pi + (-1)^n \frac{\pi}{2} - \frac{\pi}{6}$

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$a\cos\theta + b\sin\theta = c$ Solve.

Q $3\sin x + 4\cos x = 5$

1) $a=4,\ b=3,\ c=5$

2) $\dfrac{c}{\sqrt{a^2+b^2}} = \dfrac{5}{\sqrt{3^2+4^2}} = \dfrac{5}{5} = 1$

3) $\dfrac{c}{\sqrt{a^2+b^2}} = 1 \in [-1,1]$

Cosθ का 1 = 0° है

4) $\theta = 2n\pi \pm \cos^{-1} 1 + \tan^{-1}\frac{3}{4} \Rightarrow \theta = 2n\pi \pm 0 + \tan^{-1}\frac{3}{4}$

OR

$\theta = n\pi + (-1)^n \sin^{-1} 1 - \tan^{-1}\frac{4}{3} \Rightarrow \theta = n\pi + (-1)^n \cdot \frac{\pi}{2} - \tan^{-1}\frac{4}{3}$.

Sinθ का 1 = $\frac{\pi}{2}$ है

Q If $K\cos x - 3\sin x = K+1$ is solvable then $K \in$?

$a=K,\ b=-3,\ c=K+1$

It is Solvable when $\dfrac{c}{\sqrt{a^2+b^2}}$

$-1 \le \dfrac{K+1}{\sqrt{K^2+(-3)^2}} \le 1$

$-1 \le \dfrac{K+1}{\sqrt{K^2+9}} \le 1$ $\oplus$

$|x| \le 1 \Rightarrow -1 \le x \le 1$

$\left|\dfrac{K+1}{\sqrt{K^2+9}}\right| \le 1$

$\dfrac{|K+1|}{\sqrt{K^2+9}} \le 1 \Rightarrow |K+1| \le \sqrt{K^2+9}$ Squaring

$(K+1)^2 \le K^2+9 \Rightarrow \cancel{K^2} + 2K + 1 \le \cancel{K^2} + 9$

$2K \le 8 \Rightarrow \boxed{K \le 4}$

$K \in (-\infty, 4]$

Best Qs.

Solve

Q $\sin^3 x + \cos^3 x + \frac{3}{2\sqrt{2}}\sin 2x = \frac{1}{2\sqrt{2}}$

Concept.

$a^3+b^3+c^3-3abc=0$

$a+b+c=0$ $\quad$ $a=b=c$

$\Rightarrow (\sin x)^3+(\cos x)^3+\left(-\frac{1}{\sqrt{2}}\right)^3+\frac{3}{2\sqrt{2}}\,2\sin x\cdot\cos x=0$

$a^3 \quad + \quad b^3 \quad + \quad c^3 \quad - \quad 3 \quad c \quad a \quad b = 0$

$\Rightarrow (\sin x)^3+(\cos x)^3+\left(-\frac{1}{\sqrt{2}}\right)^3-3\cdot\left(-\frac{1}{\sqrt{2}}\right)(\sin x)(\cos x)=0$

$\sin x+\cos x-\frac{1}{\sqrt{2}}=0$ $\quad$ OR $\quad$ $\sin x=\cos x=-\frac{1}{\sqrt{2}}$

$a=1,\ b=1,\ c=\frac{1}{\sqrt{2}}$

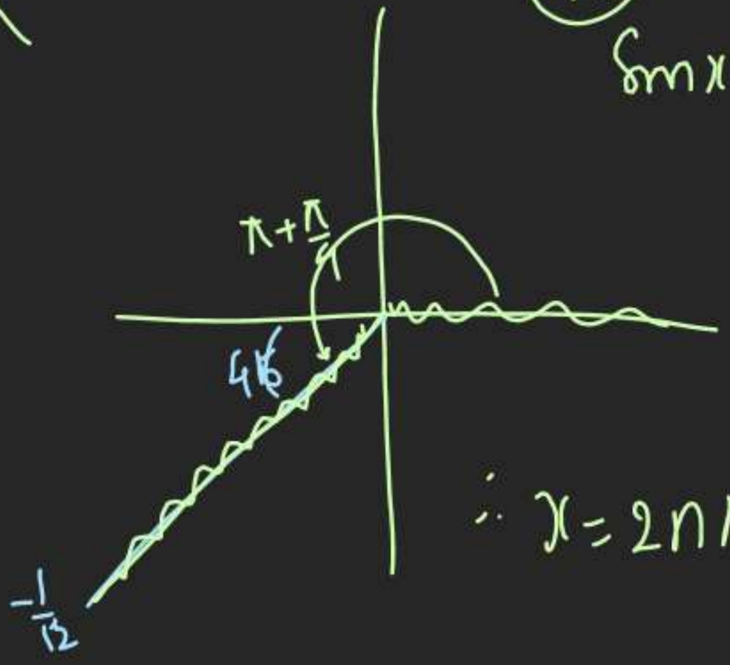
$x=2n\pi\pm\cos^{-1}\frac{1}{2}+\tan^{-1}1$

$x=2n\pi\pm\frac{\pi}{3}+\frac{\pi}{4}$

$\sin x=-\frac{1}{\sqrt{2}}$ $\quad 45°$

$\cos x=-\frac{1}{\sqrt{2}}$ $\quad 45°$

3



$\therefore x=2n\pi+\frac{5\pi}{4}$

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find G.V.

Q $\underbrace{\sin x + 3\sin 2x + \sin 3x}_{\sin C + \sin D} = \underbrace{\cos x + 3\cos 2x + \cos 3x}_{\cos C + \cos D}$.

$\sin C + \sin D = 2S \quad C.$

$\cos C + \cos D = 2C \quad C$

$2\sin(2x)\cdot\cos(+x) + 3\sin 2x = 2\cos(2x)\cos(+x) + 3\cos 2x$

$\sin 2x(2\cos x + 3) = \cos 2x(2\cos x + 3)$

$\sin 2x(2\cos x + 3) - \cos 2x(2\cos x + 3) = 0$

$(2\cos x + 3)(\sin 2x - \cos 2x) = 0$

$2\cos x + 3 = 0$ OR $\cos 2x - \sin 2x = 0$

$\cos x = -\frac{3}{2}$

$= -1.5$

Sorry Bhai ✗

$a = 1, b = -1, c = 0$

$2x = 2n\pi \pm \cos^{-1} 0 + \tan^{-1}\frac{-1}{1}$

$2x = 2n\pi \pm \frac{\pi}{2} - \frac{\pi}{4} \Rightarrow \boxed{x = n\pi \pm \frac{\pi}{4} - \frac{\pi}{8}}$

$x = n\pi + \frac{\pi}{4} - \frac{\pi}{8}$

$\boxed{x = n\pi + \frac{\pi}{8}}$

$\boxed{x = n\pi - \frac{3\pi}{8}}$