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

make quadratic in $\tan x$

Divide by $\cos^2 x$

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

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

$(\tan x + 1)(3\tan x - 4) = 0$

$\tan x = -1 \quad \tan x = 4/3$

$\tan x = -1$

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

$n \in I$

$\tan x = 4/3$

$x = n\pi + \alpha$

$\alpha = \tan^{-1} 4/3$

Q $\quad 2\sin^2 2x + 6\sin^2 x = 5$

$$2\sin^2 2x + 6\sin^2 x = 5$$

$$2(1-\cos^2 2x) + \cancel{6}^{\,3}\left(\frac{1-\cos 2x}{\cancel{2}}\right) = 5$$

$$\cancel{2} - 2\cos^2 2x + \cancel{3} - 3\cos 2x = \cancel{5}$$

$$-2\cos^2 2x - 3\cos 2x = 0$$

$$\cos 2x = 0 \qquad \underbrace{\cos 2x = -3/2}_{\times}$$

$\cos 2x = 0$

$2x = (2n-1)\frac{\pi}{2}$

$x = (2n-1)\frac{\pi}{4}$

OR

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

$x = n\pi \pm \pi/4$

$n \in I$

Q $(1-\tan\theta)(1+\sin 2\theta) = 1+\tan\theta$

$$\sin 2\theta = \frac{2\tan\theta}{1+\tan^2\theta}$$

$$(1-\tan\theta)\left(1+\frac{2\tan\theta}{1+\tan^2\theta}\right) = 1+\tan\theta$$

$$(1-\tan\theta)\left(\frac{\overbrace{1+\tan^2\theta+2\tan\theta}}{1+\tan^2\theta}\right) = 1+\tan\theta$$

$$(1-\tan\theta)\frac{(1+\tan\theta)^{\cancel{2}}}{1+\tan^2\theta} = \cancel{(1+\tan\theta)}$$

$1 + \tan\theta = 0$

$\tan\theta = -1$

$\theta = n\pi - \frac{\pi}{4}$

$(1-\tan\theta)(1+\tan\theta) = 1+\tan^2\theta$

$1-\tan^2\theta = 1+\tan^2\theta$

$\tan^2\theta = 0$

$\theta = n\pi$

$n \in I$

Q $5\tan^4 x - \sec^4 x = 29$

$\sec^2 x = 1 + \tan^2 x$

$\sec^4 x = (1 + \tan^2 x)^2$

Let $\tan^2 x = t$

$5t^2 - (1+t)^2 = 29$

$4t^2 - 2t - 30 = 0$

$2t^2 - t - 15 = 0$

$(2t+5)(t-3) = 0$

$t = -\frac{5}{2}, 3$

$\tan^2 x = \underbrace{-\frac{5}{2}}_{\times}, 3$

$\tan^2 x = 3 = (\sqrt{3})^2$

$x = n\pi \pm \pi/3$

$n \in I$

Q $\tan^2\theta + \sec 2\theta = 1$

$$\cos 2\theta = \frac{1-\tan^2\theta}{1+\tan^2\theta}$$

$$\sec 2\theta = 1 - \tan^2\theta$$

$$\frac{1}{\cos 2\theta} = 1 - \tan^2\theta$$

$$\frac{1+\tan^2\theta}{1-\tan^2\theta} = 1 - \tan^2\theta$$

let $\tan^2\theta = t$

$$\frac{1+t}{1-t} = 1 - t$$

$(1-t)^2 = 1+t$

$t^2 + \cancel{1} - 2t = \cancel{1} + t$

$t^2 - 3t = 0$

$t = 0, 3$

$\tan^2 x = 0$

$\tan x = 0$

$x = n\pi$

$n \in I$

$\tan^2 x = 3$

$\tan^2 x = (\sqrt{3})^2$

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

$n \in I$

Q find general solutions

$$\cos 4x + 6 = 7\cos 2x$$

Also find sum of all solutions in $[0, 314]$

$$\cos 4x + 6 = 7\cos 2x$$

$$2\cos^2 2x - 1 + 6 = 7\cos 2x$$

$$\cos 2x = t$$

$$2t^2 - 7t + 5 = 0$$

$$(2t-5)(t-1) = 0$$

$t = \frac{5}{2}, 1$

(1) $\cos 2x = \frac{5}{2}$

$\times$

$[0, 314]$

(2) $\cos 2x = 1$

$2x = 2n\pi$

$x = n\pi$

$n \in I$

$314 < 100\pi$

Sum $= 0 + \pi + 2\pi + \cdots\cdots\cdots\ 99\pi + \cancel{100\pi}$

$= \pi[1 + 2 + 3 \cdots\cdots\ 99]$

$= \pi \cdot \frac{99 \times 100}{2} = 4950\pi$

Q3 find general value of x

$$2\cos^2 x + 4\cos x = 3\sin^2 x$$

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

$$5\cos^2 x + 4\cos x - 3 = 0$$

$$\cos x = t$$

$$5t^2 + 4t - 3 = 0$$

$$5t^2 + 4t - 3 = 0$$

$$t = \frac{-4 \pm \sqrt{16+60}}{10}$$

$$t = \frac{-2 \pm \sqrt{19}}{5}$$

$$t = \frac{-2-\sqrt{19}}{5} \Big/ \frac{-2+\sqrt{19}}{5}$$

$\cos x$

< -1

ϕ

$$\cos x = \frac{-2+\sqrt{19}}{5}$$

$$x = 2n\pi \pm \alpha$$

$$n \in I$$

$$\alpha = \cos^{-1}\left(\frac{\sqrt{19}-2}{5}\right)$$

SOLUTION CHECKING

Q $\sin x + \sin 2x = 0$

MI

$\sin x + 2\sin x \cos x = 0$

$\sin x(2\cos x + 1) = 0$

$\sin x = 0$ or $\cos x = -\frac{1}{2}$ $\quad \frac{2\pi}{3}$

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

$n \in I$

$\underbrace{\sin x + \sin 2x}=0$

$2\sin\frac{3x}{2}\cos\frac{x}{2}=0$

$\sin\frac{3x}{2}=0$ or $\cos\frac{x}{2}=0$

$\frac{3x}{2}=n\pi$ $\qquad$ $\frac{x}{2}=(2n-1)\frac{\pi}{2}$

$x=\frac{2n\pi}{3}$ $\qquad$ $x=(2n-1)\pi$

$n\in I$

m I

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

$[0, 2\pi]$

$0, \pi, 2\pi, \frac{2\pi}{3}, 2\pi - \frac{2\pi}{3}$

$\frac{4\pi}{3}$

m II

$x = \frac{2n\pi}{3}$ or

$x = (2n-1)\pi$

$0, \frac{2\pi}{3}, \frac{4\pi}{3}, 2\pi$

π

Same

Q $\cos^2 x + \cos^2 2x = 1$

m1 $\cos^2 2x + \underbrace{\cos^2 x - 1} = 0$

$\cos^2 2x - \sin^2 x = 0$

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

$\cos 3x \cos x = 0$

$\cos 3x = 0$ or $\underline{\cos x = 0}$

$\cos 3x = 0$

$3x = (2n-1)\frac{\pi}{2}$

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

or

$\cos x = 0$

$x = (2n-1)\pi/2$

m8

$$\cos^2 x + \cos^2 2x = 1$$

$$2\cos^2 x + 2\cos^2 2x = 2$$

$$1 + \cos 2x + 2\cos^2 2x = 2$$

$$2\cos^2 2x + \cos 2x - 1 = 0$$

$$(2\cos 2x - 1)(\cos 2x + 1) = 0$$

$$\cos 2x = \frac{1}{2} \quad \text{or} \quad \underline{\cos 2x = -1}$$

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

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

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

$$\cos 2x = -1$$

$$2x = 2n\pi \pm \pi$$

$$x = n\pi \pm \pi/2$$

$$n \in \mathbb{Z}$$

mI

$x = (2n-1)\frac{\pi}{6}$ or $x = (2n-1)\frac{\pi}{2}$

$[0, 2\pi]$

$\frac{\pi}{6}, \frac{\pi}{2}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{3\pi}{2},$

$\frac{11\pi}{6},$

mII

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

or

$x = n\pi \pm \pi/2$

$\frac{\pi}{6}, \quad \pi \pm \frac{\pi}{6}, \quad 2\pi - \frac{\pi}{6}$

$\frac{5\pi}{6}, \frac{7\pi}{6} \quad \frac{11\pi}{6}$

$\frac{\pi}{2} \quad \pi \pm \pi/2$

$\frac{3\pi}{2}$

HOMEWORK CLASS#1

BB #5	1, 2, 5, 6,
BB #6	1, 2, 3, 5
Ex#1	18, 19, 20
Ex#2	13, 15, 16, 17
Ex#3	7
Ex 4A	10, 15, 17 Numerical type → 1
Ex 4B	3
Ex#5	4