TYPE #3 SUM INTO PRODUCT

$$\sin C + \sin D = 2\sin\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$$

$$\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$$

$$\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$$

$$\cos C - \cos D = 2\sin\left(\frac{C+D}{2}\right)\sin\left(\frac{D-C}{2}\right)$$

TYPE # 4 Product into Sum

$$2\sin A\cos B = \sin(A+B) + \sin(A-B)$$

$$2\cos A\sin B = \sin(A+B) - \sin(A-B)$$

$$2\cos A\cos B = \cos(A+B) + \cos(A-B)$$

$$2\sin A\sin B = \cos(A-B) - \cos(A+B)$$

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

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

$\cancel{\cos 3x} = 2\cancel{\cos 3x} \sin x$

$\cos 3x = 0$

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

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

$2\sin x = 1$

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

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

$n \in I$

Q $\sin 5x \cos 3x = \sin 6x \cos 2x$

$$2\sin 5x \cos 3x = 2\sin 6x \cos 2x$$

$$\cancel{\sin 8x} + \sin 2x = \cancel{\sin 8x} + \sin 4x$$

$$\cancel{\sin 2x} = \sin 4x$$

$$= 2\cancel{\sin 2x}\cos 2x$$

$\sin 2x = 0$

$$2x = n\pi$$

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

$$2\cos 2x = 1$$

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

$$2x = 2n\pi \pm \pi/3$$

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

$n \in I$

Q $\quad 5\sin x + 6\sin 2x + 5\sin 3x + \sin 4x = 0$

$5(\sin x + \sin 3x) + 6\sin 2x + \sin 4x = 0$

$5(2\sin 2x\cos x) + 6\sin 2x + \sin 4x = 0$

$2\sin 2x\cos 2x$

$2\sin 2x(5\cos x + 3 + \cos 2x) = 0$

$\sin 2x = 0$

$2x = n\pi$

$x = \frac{n\pi}{2} \quad n \in I$

$5\cos x + 3 + \cos 2x = 0$

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

$5\cos x + 3 + 2\cos^2 x - 1 = 0$

$2\cos^2 x + 5\cos x + 2 = 0$

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

$\cos x = -\frac{1}{2}$ $\quad \underbrace{\cos x = -2}_{\phi}$

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

$\frac{2\pi}{3}$ $(\pi - \pi/3)$

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

$n \in I$

Q

Good

$$\cos\theta - \sin 3\theta = \cos 2\theta$$

$$\cos\theta - \cos 2\theta = \sin 3\theta$$

$$\cancel{2}\, \cancel{\sin\frac{3\theta}{2}}\, \sin\frac{\theta}{2} = \sin 3\theta$$

$$= \cancel{2}\, \cancel{\sin\frac{3\theta}{2}}\, \cos\frac{3\theta}{2}$$

$$\sin\frac{3\theta}{2} = 0 \qquad \frac{3\theta}{2} = n\pi$$

$$\theta = \frac{2n\pi}{3}$$

$$\sin\frac{\theta}{2} = \cos\frac{3\theta}{2}$$ imp

Gud

$$\cos\frac{3\theta}{2} = \cos\left(\frac{\pi}{2} - \frac{\theta}{2}\right)$$

$$\frac{3\theta}{2} = 2n\pi \pm \left(\frac{\pi}{2} - \frac{\theta}{2}\right)$$

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

$$2\theta = 2n\pi + \frac{\pi}{2}$$

$$\theta = n\pi + \frac{\pi}{4} \quad n \in I$$

$$\sin A = \cos\left(\frac{\pi}{2} - A\right)$$

$$\frac{3\theta}{2} = 2n\pi - \frac{\pi}{2} + \frac{\theta}{2}$$

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

$n \in I$

Q $\underbrace{\sin x + \sin 5x}$ = $\sin 2x + \sin 4x$

$\cancel{2}\,\cancel{\sin 3x}\cos 2x = \cancel{2}\,\cancel{\sin 3x}\cos x$

(1) $\sin 3x = 0$

$3x = n\pi$ ✓

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

$n \in I$

$\cos 2x = \cos x$

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

(2) $2x = 2n\pi + x$

$x = 2n\pi$ ✓

(3)

$2x = 2n\pi - x$

$3x = 2n\pi$

$x = \frac{2n\pi}{3}$ ✓

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

$[0, 2\pi]$

$0, \frac{\pi}{3}, \frac{2\pi}{3},$
$\pi, \frac{4\pi}{3}, \frac{5\pi}{3}$
2π

$0, 2\pi$

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

SINGLE CORRECT

(A) $\frac{n\pi}{3}$ (B) $2n\pi$

(C) $\frac{2n\pi}{3}$ (D) None

$x = \frac{n\pi}{3}$ $n \in I$