Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q21

L.H.S $= \cos^6 A - \sin^6 A$

$$= \left(\cos^2 A\right)^3 - \left(\sin^2 A\right)^3$$

$$= \left(\cos^2 A - \sin^2 A\right)\left(\cos^4 A + \sin^2 A.\cos^2 A + \sin^4 A\right) \quad \left[\because a^3 - b^3 = (a-b)\left(a^2 + ab + b^2\right)\right]$$

$$= \cos 2A\left(\cos^4 A + 2\sin^2 A \ \ \cos^2 A + \sin^4 A - \sin^2 A \ \cos^2 A\right)$$

$$\left[\because \cos^2 A - \sin^2 A = \cos^2 A \ \& \ \text{Adding and subtracing } \sin^2 A \cos^2 A\right]$$

$$= \cos 2A\left[\left(\sin^2 A + \cos^2 A\right)^2 - \frac{4}{4}\sin^2 A \ \cos^2 A\right]$$

$$= \cos 2A\left[1 - \frac{1}{4}(2\sin A\cos A)^2\right]$$

$$= \cos 2A\left[1 - \frac{1}{4}\sin^2 2A\right]$$

= RHS

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q22

L.H.S $= \tan\left(\frac{\pi}{4} + \theta\right) + \tan\left(\frac{\pi}{4} - \theta\right)$

$$= \frac{\tan\frac{\pi}{4} + \tan\theta}{1 - \tan\frac{\pi}{4}\tan\theta} + \frac{\tan\frac{\pi}{4} - \tan\theta}{1 + \tan\frac{\pi}{4}\tan\theta}$$

$$= \frac{1 + \tan\theta}{1 - \tan\theta} + \frac{1 - \tan\theta}{1 + \tan\theta} \qquad \left[\because \tan\frac{\pi}{4} = 1\right]$$

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

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

$$= \frac{2\sec^2\theta}{1 - \frac{\sin^2\theta}{\cos^2\theta}} \qquad \left[\because \sec^2\theta = 1 + \tan^2\theta\right]$$

$$= \frac{2\sec^2\theta.\cos^2\theta}{\cos^2\theta - \sin^2\theta} \qquad \left[\because \sec = \frac{1}{\cos\theta}\right]$$

$$= \frac{2}{\cos 2\theta}$$

$$= 2\sec 2\theta$$

= RHS

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q23

L.H.S$= \cot^2 A - \tan^2 A$

$$= \frac{\cos^2 A}{\sin^2 A} - \frac{\sin^2 A}{\cos^2 A}$$

$$= \frac{(\cos^2 A)^2 - (\sin^2 A)^2}{\sin^2 A \ \cos^2 A}$$

$$= \frac{(\cos^2 A + \sin^2 A)(\cos^2 A - \sin^2 A)}{(\sin A \ \cos A)^2} \quad [\because \ a^2 - b^2 - = (a+b)(a-b)]$$

$$= \frac{\cos 2A}{\frac{1}{4}(2\sin A \ \cos A)^2} \quad [\because \cos 2A = \cos^2 A - \sin^2 A]$$

$$= \frac{4\cos 2A}{\sin^2 2A}$$

$$= \frac{4\cos 2A}{\sin 2A} \cdot \frac{1}{\sin 2A} \quad \left[\because \operatorname{cosec}\theta = \frac{1}{\sin\theta}\right]$$

$= 4\cot 2A. \operatorname{cosec} 2A$
$=$ RHS

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q24

$$\cos 4\theta - \cos 4\alpha = 2\cos^2 2\theta - 2\cos^2 2\alpha$$
$$= 2(\cos 2\theta + \cos 2\alpha)(\cos 2\theta - \cos 2\alpha)$$
$$= 2(2\cos^2\theta - 1 + 1 - 2\sin^2\alpha)(2\cos^2\theta - 1 - 2\cos^2\alpha + 1)$$
$$= 8(\cos^2\theta - \sin^2\alpha)(\cos^2\theta - \cos^2\alpha)$$
$$= 8(\cos\theta - \sin\alpha)(\cos\theta + \sin\alpha)(\cos\theta - \cos\alpha)(\cos\theta + \cos\alpha)$$

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q25

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

$$= 2\cos\left(\frac{3x+x}{2}\right)\sin\left(\frac{3x-x}{2}\right) + 2\sin x\cos x \ldots\ldots\ldots\ldots \left[\begin{array}{l}\because \sin A - \sin B = 2\cos\left(\frac{A+B}{2}\right)\sin\left(\frac{A-B}{2}\right) \\ \sin 2x = 2\sin x\cos x\end{array}\right]$$

$= 2\cos(2x)\sin(x) + 2\sin x\cos x$
$= 2\sin x[\cos(2x) + \cos x]$

$$= 2\sin x\left[2\cos\left(\frac{2x+x}{2}\right) + \cos\left(\frac{2x-x}{2}\right)\right] \ldots\ldots\ldots\ldots \left[\because \cos A + \cos B = 2\cos\left(\frac{A+B}{2}\right)\cos\left(\frac{A-B}{2}\right)\right]$$

$$= 4\sin x\cos\frac{3x}{2}\cos\frac{x}{2}$$

*********** END **********