Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q16

LHS= $\cos^2\left(\frac{\pi}{4}-\theta\right)-\sin^2\left(\frac{\pi}{4}-\theta\right)$

$=\cos 2\left(\frac{\pi}{4}-\theta\right)$ $\left[\because \cos 2\theta=\cos^2\theta-\sin^2\theta\right]$

$=\cos\left(\frac{\pi}{2}-2\theta\right)$ $\left[\because \cos\left(\pi/2-\theta\right)=\sin\theta\right]$

$=\sin 2\theta$

= RHS

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q17

LHS= $\cos 4A$

$=\cos 2.2A$

$=2\cos^2 2A-1\left[\because \cos 2\theta=2\cos^2\theta-1\right]$

$=2\left(2\cos^2 A-1\right)^2-1$

$=2\left(4\cos^4 A-4\cos^2 A+1\right)-1$

$=8\cos^4 A-8\cos^2 A+1$

$=1-8\cos^2 A+8\cos^4 A$

= RHS

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q18

LHS = $\sin 4A$

$=\sin 2.2A$

$=2\sin 2A\cos 2A$

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

$=4\sin A\cos^3 A-4\sin^3 A\cos A$

= RHS

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q19

$$\text{LHS}= \quad 3\left(\sin x-\cos x\right)^4+6\left(\sin x+\cos x\right)^2+4\left(\sin^6 x+\cos^6 x\right)$$

$$=3\left[\sin^4 x-4\sin^3 x\cos x+6\sin^2 x\cos^2 x-4\sin x\cos^3 x+\cos^4 x\right]$$
$$+6\left[\sin^2 x+2\sin x\cos x+\cos^2 x\right]+4\left(\sin^6 x+\cos^6 x\right)$$
$$\left[\because (a-b)^4=a^4-4a^3b+6a^2b^2-4ab^3+b^4 \text{ by binomial expainsion}\right]$$

$$=3\left[\sin^4 x+\cos^4 x-4\sin x\cos x\left(\sin^2 x+\cos^2 x\right)+6\sin^2 x\cos^2 x\right]$$

$$+6\left[1+2\sin x\cos x\right]+4\left[\left(\cos^2 x+\sin^2 x\right)\left(\cos^4 x-\cos^2 x\sin^2 x+\sin^4 x\right)\right]$$
$$\left[\because a^3+b^3=(a+b)\left(a^2-ab+b^2\right)\right]$$

$$=7\left[\sin^4 x+\cos^4 x\right]+18\sin^2 x\cos^2 x-4\sin^2 x\cos^2 x+6$$

$$=7\left[\sin^4 x+\cos^4 x+2\sin^2 x\cos^2 x\right]+6$$

$$=7\left[\sin^2 x+\cos^2 x\right]^2+6$$

$$=7+6$$
$$=13$$
$$=RHS$$

Trigonometric Ratios of multiple and Sub multiple Angles Ex 9.1 Q20

$$\text{L.H.S}=2\left(\sin^6 x+\cos^6 x\right)-3\left(\sin^4 x+\cos^4 x\right)+1$$
$$=2\left(\left(\sin^2 x\right)^3+\left(\cos^2 x\right)^3\right)-3\left(\sin^4 x+\cos^4 x\right)+1 \qquad \left[\because a^3+b^3=(a+b)\left(a^2-ab+b^2\right)\right]$$
$$=2\left[\left(\sin^2 x+\cos^2 x\right)\left(\sin^4 x-\sin^2 x\cos^2 x+\cos^4 x\right)\right]-3\left(\sin^4 x+\cos^4 x\right)+1$$
$$=-\left[\sin^4 x+\cos^4 x+2\sin^2 x\cos^2 x\right]+1$$
$$=-\left[\sin^2 x+\cos^2 x\right]+1$$
$$=-1+1$$
$$=0$$
$$=\text{RHS}$$

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