Trigonometric Ratios of multiple and Submultiple Angles Ex 9.3 Q 1

We have,

$$\sin^2 72^\circ - \sin^2 60^\circ.$$

$$= \sin^2(90^\circ - 18^\circ) - \left(\frac{\sqrt{3}}{2}\right)^2$$

$$= \cos^2 18^\circ - \frac{3}{4}$$

$$= \left(\frac{\sqrt{10+2\sqrt{5}}}{4}\right)^2 - \frac{3}{4} \quad \left[\because \cos 18^\circ = \frac{\sqrt{10+2\sqrt{5}}}{4}\right]$$

$$= \frac{10+2\sqrt{5}}{16} - \frac{3}{4}$$

$$= \frac{10+2\sqrt{5}-12}{16}$$

$$= \frac{2\sqrt{5}-2}{16}$$

$$= \frac{\sqrt{5}-1}{8}$$

Trigonometric Ratios of multiple and Submultiple Angles Ex 9.3 Q 2

L.H.S= $\sin^2 24^\circ - \sin^2 6^\circ$

$$= \sin(24+6)\sin(24-6) \quad \left[\because \sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B\right]$$

$$= \sin 30^\circ \ \sin 18^\circ$$

$$= \frac{1}{2} \cdot \frac{\sqrt{5}-1}{4} \quad \left[\because \sin 18^\circ = \frac{\sqrt{5}-1}{4}\right]$$

$$= \frac{\sqrt{5}-1}{8}$$

= RHS

Trigonometric Ratios of multiple and Submultiple Angles Ex 9.3 Q 3

L.H.S= $\sin^2 42^\circ - \cos^2 78^\circ$

$$= \sin^2(90-48) - \cos^2(90-12)$$

$$= \cos^2 48^\circ - \sin^2 12^\circ$$

$$= \cos(48+12) . \cos(48-12)$$

$$\left[\because \cos(A+B) . \cos(A-B) = \cos^2 A - \sin^2 B\right]$$

$$= \cos 60^\circ . \ \cos 36^\circ$$

$$= \frac{1}{2} \cdot \frac{\sqrt{5}+1}{4} \quad \left[\because \cos 36^\circ = \frac{\sqrt{5}+1}{4}\right]$$

$$= \frac{\sqrt{5}+1}{8}$$

= RHS

Trigonometric Ratios of multiple and Submultiple Angles Ex 9.3 Q 4

$$\text{L.H.S} = \cos 78^\circ . \cos 42^\circ . \cos 36^\circ$$

$$= \frac{\left(2\cos 78^\circ . \cos 42^\circ\right)}{2} . \cos 36^\circ$$

$$= \frac{1}{2}\left(\cos 120^\circ + \cos 36^\circ\right) . \cos 36^\circ$$

$$= \frac{1}{2}\left(\frac{-1}{2} + \frac{\sqrt{5}+1}{4}\right)\frac{\sqrt{5}+1}{4}$$

$$= \frac{1}{8}\frac{\left[-2\left(\sqrt{5}+1\right) + 5 + 1 + 2\sqrt{5}\right]}{4}$$

$$= \frac{1}{8}\left[\frac{4}{4}\right]$$

$$= \frac{1}{8}$$

$= \text{RHS}$

Trigonometric Ratios of multiple and Submultiple Angles Ex 9.3 Q 5

$$\text{L.H.S} = \cos\frac{\pi}{15} . \cos\frac{2\pi}{15} . \cos\frac{4\pi}{15} . \cos\frac{7\pi}{15}$$

$$= \frac{2\sin\frac{\pi}{15} . \cos\frac{\pi}{15}}{2\sin\frac{\pi}{15}} . \cos\frac{2\pi}{15} . \cos\frac{4\pi}{15} . \cos\frac{7\pi}{15} \quad \left[\text{Divide and multiply by } 2\sin\frac{\pi}{15}\right]$$

$$= \frac{2 . \sin\frac{2\pi}{15}}{2.2\sin\frac{\pi}{15}} . \cos\frac{2\pi}{15} . \cos\frac{4\pi}{15} . \cos\frac{7\pi}{15}$$

$$= \frac{2 . \sin\frac{4\pi}{15}}{2.4\sin\frac{\pi}{15}} . \cos\frac{4\pi}{15} . \cos\frac{7\pi}{15}$$

$$= \frac{2\sin\frac{8\pi}{15}}{2.8\sin\frac{\pi}{15}} . \cos\left(\frac{7\pi}{15}\right)$$

$$= \frac{\sin\left(\frac{8\pi}{15} + \frac{7\pi}{15}\right) + \sin\left(\frac{8\pi}{15} - \frac{7\pi}{15}\right)}{16\sin\frac{\pi}{15}}$$

$$= \frac{\sin\pi + \sin\pi/15}{16\sin\pi/15}$$

$$= \frac{\sin\pi/15}{16\sin\pi/15} \qquad [\because \sin\pi = 0]$$

$$= \frac{1}{16}$$

$= \text{RHS}$

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