

Trigonometric Identities

Exercise 10.4 for Class XI

Question # 1 Express the following products as sums or differences:

- (i) $2 \sin 3\theta \cos \theta$
- (ii) $2 \cos 5\theta \cos 3\theta$
- (iii) $\sin 5\theta \cos 2\theta$
- (iv) $2 \sin 7\theta \sin 2\theta$
- (v) $\cos(x+y) \sin(x-y)$
- (vi) $\cos(2x+30^\circ) \cos(2x-30^\circ)$
- (vii) $\sin 12^\circ \sin 46^\circ$
- (viii) $\sin(x+45^\circ) \sin(x-45^\circ)$

Question # 2 Express the following sum or difference as product:

- (i) $\sin 5\theta + \sin 3\theta$
- (ii) $\sin 8\theta - \sin 4\theta$
- (iii) $\cos 6\theta + \cos 3\theta$
- (iv) $\cos 7\theta - \cos \theta$
- (v) $\cos 12^\circ + \cos 48^\circ$
- (vi) $\sin(x+30^\circ) + \sin(x-30^\circ)$

Question # 3 Prove the following identities:

- (i) $\frac{\sin 3x - \sin x}{\cos x - \cos 3x} = \cot 2x$
- (ii) $\frac{\sin 8x + \sin 2x}{\cos 8x + \cos 2x} = \tan 5x$
- (iii) $\frac{\sin \alpha - \sin \beta}{\sin \alpha + \sin \beta} = \cot \left(\frac{\alpha + \beta}{2} \right) \tan \left(\frac{\alpha - \beta}{2} \right)$

Question # 4 Prove that:

- (i) $\cos 20^\circ + \cos 100^\circ + \cos 140^\circ = 0$
- (ii) $\sin \left(\frac{\pi}{4} - \theta \right) \sin \left(\frac{\pi}{4} + \theta \right) = \frac{1}{2} \cos 2\theta$
- (iii) $\frac{\sin \theta + \sin 3\theta + \sin 5\theta + \sin 7\theta}{\cos \theta + \cos 3\theta + \cos 5\theta + \cos 7\theta} = \tan 4\theta$

Question # 5 Prove that:

- (i) $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$
- (ii) $\sin \frac{\pi}{9} \sin \frac{2\pi}{9} \sin \frac{\pi}{3} \sin \frac{4\pi}{9} = \frac{3}{16}$