

Problems based on transformation formulae
(product to sum and vice versa conversion)

$$1. \frac{\sin A + 2 \sin 5A + \sin 9A}{\cos A + 2 \cos 5A + \cos 9A} = \tan 5A$$

$$2. \sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$$

$$3. \cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$$

$$4. \cos 5\theta = A \cos^5 \theta + B \cos^3 \theta + C \cos \theta$$

Find A, B and C.

$$5. \text{ If } 3 \tan(a) = 3 \tan(b)$$

$$\text{Then, prove } \tan(a-b) = \frac{\sin 2b}{5 - \cos 2b}$$

$$6. \tan 6^\circ \tan 42^\circ \tan 66^\circ \tan 78^\circ = 1$$

$$7. \cos \frac{\pi}{15} \cos \frac{2\pi}{15} \cos \frac{3\pi}{15} \dots \cos \frac{7\pi}{15} = \frac{1}{2^7}$$

$$8. A+B+C = 180^\circ \text{ Then,}$$

$$\cos 2A + \cos 2B + \cos 2C = -1 - 4 \cos A \cos B \cos C$$

$$9. \sin A + \sin B + \sin C = 4 \sin(A/2) \sin(B/2) \sin(C/2)$$

$$10. \frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} \geq 2 \quad \forall x$$