Double Angles Identities

$\sin 2A$

$\sin(A+A)$

$\sin A\cos A + \cos A\sin A$

$2\sin A\cos A$

$\boxed{\sin 2A = 2\sin A\cos A}$

$\cos 2A$

$\cos(A+A)$

$\cos A\cos A - \sin A\sin A$

$\boxed{\cos^2 A - \sin^2 A}$

$1-\sin^2 A - \sin^2 A$

$\boxed{1-2\sin^2 A}$

$\cos^2 A - (1-\cos^2 A)$

$\boxed{2\cos^2 A - 1}$

Double Angles Identities

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

$\cos 2A = \cos^2 A - \sin^2 A$

$\cos 2A = 1 - 2\sin^2 A$

$\cos 2A = 2\cos^2 A - 1$

Ex 1: Expand $\sin 60^\circ$ using $\sin 2A = 2\sin A\cos A$

$2A = 60^\circ$

$A = 30^\circ$

$\sin 60^\circ = 2\sin 30^\circ \cos 30^\circ$

$\frac{\sqrt{3}}{2} = 2\left(\frac{1}{2}\right)\left(\frac{\sqrt{3}}{2}\right)$

$\frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2}$ ✓

Ex 2: Expand $\cos 90^\circ$ using $\cos 2A = 2\cos^2 A - 1$

$2A = 90^\circ$

$A = 45^\circ$

$\cos 90^\circ = 2\cos^2 45^\circ - 1$

$0 = 2\left(\frac{\sqrt{2}}{2}\right)^2 - 1$

$0 = 2\left(\frac{1}{2}\right) - 1$

$0 = 1 - 1$

$0 = 0$ ✓

Ex 3: Expand $\cos 2\pi/3$ using $\cos 2A = \cos^2 A - \sin^2 A$

$2A = \frac{2\pi}{3}$

$A = \frac{2\pi}{3}\left(\frac{1}{2}\right)$

$A = \frac{\pi}{3}$

$\cos\frac{2\pi}{3} = \cos^2\frac{\pi}{3} - \sin^2\frac{\pi}{3}$

$\cos\frac{2\pi}{3} = \left(\frac{1}{2}\right)^2 - \left(\frac{\sqrt{3}}{2}\right)^2$

$-\frac{1}{2} = \frac{1}{4} - \frac{3}{4}$

$-\frac{1}{2} = \frac{-1}{2}$ ✓

Ex 4: Expand $\cos 8x$ using $\cos 2A = 1 - 2\sin^2 A$

$2A = 8x$

$A = 4x$

$\cos 8x = 1 - 2\sin^2 4x$

Ex 5: Condense $1 - 2\sin^2 150^\circ$

$A = 150^\circ$

$2A = 300^\circ$

$\cos 300^\circ$

Ex 6: Condense $2\sin 3x \cos 3x$

$A = 3x$

$2A = 6x$

$\sin 6x$

Ex 7: Condense $\cos^2 \pi - \sin^2 \pi$

$\cos 2\pi$

Ex 8: Prove: $\sin 2x + \cos x = \cos x(2\sin x + 1)$

$= 2\sin x\cos x + \cos x$

$= \sin 2x + \cos x$ ✓