

Double Angle Formulas

$$\sin 2x = ?$$

$$\sin 2x = \sin (x+x)$$

$$\sin(x+x) = \sin x \cos x + \cos x \sin x$$

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

$$\cos 2x = ?$$

$$\cos 2x = \cos (x+x)$$

$$\cos (x+x) = \cos x \cos x - \sin x \sin x$$

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

or

$$\cos 2x = (1 - \sin^2 x) - \sin^2 x$$

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

or

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

$$= \cos^2 x - (1 - \cos^2 x)$$

$$= \cos^2 x - 1 + \cos^2 x$$

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

∴ Double angle formulas:

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

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

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

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