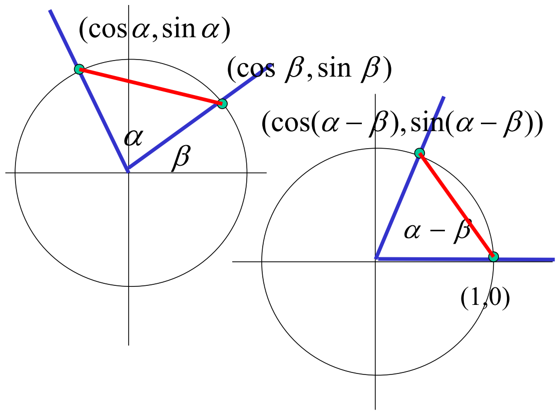

$$(\cos\alpha - \cos\beta)^2 + (\sin\alpha - \sin\beta)^2 =$$
$$(\cos(\alpha-\beta) - 1)^2 + (\sin(\alpha-\beta) - 0)^2$$

$$\cos^2\alpha - 2\cos\alpha\cos\beta + \cos^2\beta +$$
$$\sin^2\alpha - 2\sin\alpha\sin\beta + \sin^2\beta =$$
$$\cos^2(\alpha-\beta) - 2\cos(\alpha-\beta) + 1 + \sin^2(\alpha-\beta)$$

$$1 + 1 - 2\cos\alpha\cos\beta - 2\sin\alpha\sin\beta =$$
$$1 + 1 - 2\cos(\alpha-\beta)$$

$$\boxed{\cos(\alpha-\beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta}$$

Sum and Difference Formulas for Cosines

$$\cos(\alpha+\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$$
$$\cos(\alpha-\beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$$

Find the exact value of $\cos(105^\circ)$.

$$\cos(105^\circ) = \cos(60^\circ + 45^\circ)$$
$$= \cos 60^\circ \cos 45^\circ - \sin 60^\circ \sin 45^\circ$$
$$= \frac{1}{2}\cdot\frac{\sqrt{2}}{2} - \frac{\sqrt{3}}{2}\cdot\frac{\sqrt{2}}{2}$$
$$= \frac{\sqrt{2}}{4} - \frac{\sqrt{6}}{4} = \frac{\sqrt{2}-\sqrt{6}}{4}$$