2.51

$$exp(iA)exp(-iA) = 1$$

$$\implies (\cos A + i\ \sin A)(\cos(-A) + i\ \sin(-A)) = 1$$

$$\implies (\cos A + i\ \sin A)(\cos A - i\ \sin A) = 1$$

$$\implies \cos^2 A - (i\ \sin A)^2 = 1$$

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

$$\implies \cos^2 A + \sin^2 A = 1$$

$$\cos(A - B) = \mathcal{R}\exp\{i(A - B)\}$$

$$= \mathcal{R}\exp\{i\,A\}\exp\{-i\,B)\}$$

$$= \mathcal{R}(\cos A + i\ \sin A)(\cos(-B) + i\ \sin(-B))$$

$$= \mathcal{R}(\cos A + i\ \sin A)(\cos B - i\ \sin B)$$

$$= \mathcal{R}(\cos A\ \cos B + i\ \sin A\ \cos B - i\ \cos A\ \sin B - i^2 \sin A\ \sin B)$$

$$= \mathcal{R}(\cos A \cos B + i\ \sin A\ \cos B - i\ \cos A\ \sin B + \sin A\ \sin B)$$

$$= \cos A \cos B + \sin A \sin B$$

Using the above result,

$$\sin(A - B) = \mathcal{I}\exp\{i(A - B)\}$$

$$= \sin A\ \cos B - \cos A\ \sin B$$