If $A = \begin{pmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{pmatrix}$ and $B = \Big(\begin{matrix} \cos^2 \\ \cos\beta\,\mathrm{si} \end{matrix}$
that $\alpha = 5\frac{\pi}{2} + \beta$, then show that $AB = BA = 0$.

Since we have given $\alpha = \frac{5\pi}{2} + \beta$

$\Longrightarrow \cos a = \cos\left(\frac{5\pi}{2} + \beta\right) = \cos\frac{5\pi}{2}\cos\beta - \sin\frac{5\pi}{2}\sin\beta = (0)\cos\beta - (1)\sin\beta = -\sin\beta$

$\Longrightarrow \sin a = \sin\left(\frac{5\pi}{2} + \beta\right) = \sin\frac{5\pi}{2}\cos\beta + \cos\frac{5\pi}{2}\sin\beta = (1)\cos\beta + (0)\sin\beta = \cos\beta$

Now

$$AB = \begin{pmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{pmatrix} \begin{pmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^2\beta \end{pmatrix}$$

$$= \begin{pmatrix} (-\sin\beta)^2 & -\cos\beta\sin\beta \\ -\cos\beta\sin\beta & \cos^2\beta \end{pmatrix} \begin{pmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^2\beta \end{pmatrix}$$

$$= \begin{pmatrix} (-\sin\beta)^2 & -\cos\beta\sin\beta \\ -\cos\beta\sin\beta & \cos^2\beta \end{pmatrix} \begin{pmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^2\beta \end{pmatrix}$$

$$= \begin{pmatrix} \sin^2\beta & -\cos\beta\sin\beta \\ -\cos\beta\sin\beta & \cos^2\beta \end{pmatrix} \begin{pmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^2\beta \end{pmatrix}$$

$$= \begin{pmatrix} \sin^2\beta\cos^2\beta - \cos^2\beta\sin^2\beta & \sin^2\beta\cos\beta\sin\beta - \sin^2\beta\cos\beta\sin\beta \\ -\cos^2\beta\cos\beta\sin\beta + \cos^2\beta\cos\beta\sin\beta & -\cos^2\beta\sin^2\beta + \cos^2\beta\sin^2\beta \end{pmatrix}$$

$$= \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix} = BA \text{ as well. } \square$$