Question #16969

It is known that $SU(2)$ is isomorphic to $SO(3)$. The $R_z(\varphi) \in SO(3)$ transformation in 3-dimensional space is represented by special unitary transformation $R_z' = \begin{pmatrix} e^{i\varphi/2} & 0 \\ 0 & e^{-i\varphi/2} \end{pmatrix} \in SU(2)$.

As it is known, $S_z = \frac{1}{2}\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$. Taking the commutator $[R_z', S_z] = R_z' \cdot S_z - S_z \cdot R_z'$, it is obvious, that it is equal to zero (because only diagonal elements of these matrices are not equal to zero – check it by multiplying matrices).