Quiz #16 (Unitary and Hermitian operators)

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Quantum Mechanics
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Prob.1(2)

Determine the unitary operator that transforms any two-dimension vector represented by orthonormal bases $\overline{x}, \overline{y}$ into a vector represented by another set of orthonormal bases $\overline{x}', \overline{y}'$, which are 45 deg rotated from $\overline{x}, \overline{y}$.

Prob.2(2)

An operator is given as $\hat{A} = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ in the two-dimension space represented by $\overline{x}, \overline{y}$.

What becomes to this operator in the two-dimension spaced represented by $\overline{x}', \overline{y}'$?

Prob. 3(2)

Prove that a Hermitian operator has real eigen values.