matrices de Pauli

$$\sigma_1 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \quad \sigma_2 = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix} \quad \sigma_3 = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \quad \sigma_0 \equiv I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

matriz 2×2 Hermítica $\Rightarrow A = \begin{pmatrix} z_1 & z_2 \\ z_3 & z_4 \end{pmatrix} = A^{+} = \begin{pmatrix} z_1^* & z_3^* \\ z_2^* & z_4^* \end{pmatrix}$

$z_1^* = z_1$ Real

$z_4^* = z_4$ Real

$z_2^* = z_3$ Complejos

$$\alpha_1 \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} + \alpha_2 \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix} + \alpha_3 \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} + \alpha_4 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} z_1 & z_2 \\ z_3 & z_4 \end{pmatrix}$$

$\cancel{\alpha_1(0)} + \cancel{\alpha_2(0)} + \alpha_3(1) + \alpha_4(1) = z_1$

$\alpha_1(1) + \alpha_2(-i) + \cancel{\alpha_3(0)} + \cancel{\alpha_4(0)} = z_2$

$\alpha_3(1) + \alpha_2(i) + \cancel{\alpha_3(0)} + \cancel{\alpha_4(0)} = z_3$

$\cancel{\alpha_1(0)} + \cancel{\alpha_2(0)} + \alpha_3(-1) + \alpha_4(1) = z_4$

$z_1 = \alpha_3 + \alpha_4 \longrightarrow$ Real

$z_2 = \alpha_1 + \alpha_2(-i) \longrightarrow \mathbb{C}$

$z_3 = \alpha_3 + \alpha_2(i) \longrightarrow \mathbb{C}$

$z_4 = \alpha_4 - \alpha_3 \longrightarrow$ Real.

B) $\rightarrow$ $\boxed{\langle e_2 | e_1 \rangle = 0.}$

$\boxed{\begin{array}{l} A^{-1} = A^{t}. \\ A \cdot A^{t} = I_n \end{array}}$ la matriz por su transpuesta es la identidad

$\langle a|b \rangle \rightleftharpoons \mathrm{Tr}(A^{+}B)$

$u_1 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \quad u_1^{-1} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$