ECS 521/641: Spintronics and Nanomagnetics

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HW #1

Problem 1

Determine the inverse of the matrices. (a) $\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}$ (b) $\begin{bmatrix}1 & 1\\ 2 & 2\end{bmatrix}$

Use MATLAB to do the same.

Problem 2

Determine the eigenvalues and eigenvectors of the matrices.

(a) $\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}$ (b) $\begin{bmatrix}1 & 1\\ 2 & 2\end{bmatrix}$

Use MATLAB to do the same.

Problem 3

Determine the eigenvectors of the Pauli spin matrices.

Problem 4

(a) $\det(\sigma_j) = -1 \; for \; j = x, y, z$

(b) $Tr(\sigma_j) = 0$

(c) $\sigma_x^2 = \sigma_y^2 = \sigma_z^2 = I$

(d) $\sigma_x \sigma_y \sigma_z = iI$

(e) $\sigma_x \sigma_y = -\sigma_y \sigma_x = i\sigma_z$

(f) $\sigma_y \sigma_z = -\sigma_z \sigma_y = i\sigma_x$

(g) $\sigma_z \sigma_x = -\sigma_x \sigma_z = i\sigma_y$

(h) $\sigma_p \sigma_q + \sigma_q \sigma_p = 0 \;\; for \; p \neq q, p, q = x, y, z$