

Physics 472 - 2020

Quantum Mechanics

Quiz 4

Your name:

Show that any matrix $A = \begin{pmatrix} \alpha & \beta \\ \gamma & \delta \end{pmatrix}$ can be written as a sum of the Pauli matrices

$$\sigma_x = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}, \quad \sigma_y = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}, \quad \sigma_z = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

and the unit matrix.

Extra credit, 5 points: Consider a hypothetical particle with spin $S = 3/2$ and the gyromagnetic ratio (the ratio of the magnetic moment to the angular momentum) γ in a magnetic field B . The particle has zero orbital angular momentum. Find the energy levels.