PHYSICS 201
1ˢᵗ HOMEWORK
Dr. V. Lempesis

Hand in: Tuesday 8ᵗʰ of October March 2013

Student Name : _____

Student ID: _____

1. Solve the following matrix equation, $2(\mathbf{X}+\mathbf{B})=3(\mathbf{X}-\mathbf{A})-4\mathbf{B}$, if

$$\mathbf{A}=\begin{bmatrix} -1 & 1 & -3 \\ 2 & 0 & 6 \end{bmatrix}, \quad \mathbf{B}=\begin{bmatrix} -3 & -1 & 0 \\ 7 & 0 & 3 \end{bmatrix}.$$

2. If,

$$\mathbf{A}=\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$$

show that

$$\mathbf{A}^n=\begin{bmatrix} a^n & 0 & 0 \\ 0 & b^n & 0 \\ 0 & 0 & c^n \end{bmatrix}, \quad (n \in \mathbb{N}).$$

3. Show that $\left[\mathbf{A},\mathbf{B}\right]=\mathbf{C}$

$$\mathbf{A}=\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}, \quad \mathbf{B}=\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}, \quad \mathbf{C}=\begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}.$$

4. The three Pauli spin matrices are

$$\sigma_1=\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}, \quad \sigma_2=\begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}, \quad \sigma_3=\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}.$$

Calculate σ_i^2 for $i=1, 2, 3$.

These matrices were used by Pauli in the nonrelativistic theory of electron spin