Physics 200-05
Assignment 6

1) What is the derivative with respect to time of the following matrices? Are they Hermitean matrices? In case a) find the eigenvectors. Remember, i in all equations is treated as just another variable, except that $i^2 = -1$.

a)

$$\begin{pmatrix} 1 & e^{i\omega t} \\ e^{-i\omega t} & 1 \end{pmatrix} \tag{1}$$

b)

$$\begin{pmatrix} \cos(\omega t) & i\sin(\omega t) \\ i\sin(\omega t) & \cos(\omega t) \end{pmatrix} \tag{2}$$

2) What are the eigenvalues of the following matrices?

a)

$$\begin{pmatrix} 1 & 3i \\ -3i & -1 \end{pmatrix} \tag{3}$$

b)

$$\begin{pmatrix} 1 & 2 \\ 2 & 0 \end{pmatrix} \tag{4}$$

3) a) Given the expression

$$A = \beta_0 I + \vec{\beta} \cdot \vec{\Sigma} \tag{5}$$

Show that the matrix

$$\frac{1}{\beta_0^2 - \vec{\beta} \cdot \vec{\beta}} \left(\beta_0 I - \vec{\beta} \cdot \vec{\Sigma} \right) \tag{6}$$

is the inverse of A. What is the condition that the matrix A not have an inverse.

b) What is the inverse of the two matrices in problem 2

4) A particle is found by measurement to have the the value $+1$ for the physical attribute represented by the matrix Σ_1. What is the probability that if the physical attribute represented by the $\Sigma_1 + \Sigma_2$ matrix is measured, its value is found to be the largest eigenvalue.

5) A particle is found by measurement to have the value of $+1$ for the attribute represented by Σ_3. Then the attribute Σ_2 is measured and also found to have value $+1$. What is the probability that if Σ_3 is remeasured, its value is found to be -1?