Physics 475, Spring 2010
Problem Set 3
Due Tuesday, February 16.

Problems from Boas:

Chapter 3:
4.21, 4.22, 6.6, 7.19, 9.15

Additional Problems

1. What are the four components of the matrix $e^{iM\theta/2}$, where θ is a real number and

$$M = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}?$$

Hint: Expand the exponential in a power series. What is M^2?

2. What are the nine components of the matrix $e^{iM\theta}$, where θ is a real number and

$$M = \begin{pmatrix} 0 & -i & 0 \\ i & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}?$$

3. a) Show that for any three vectors $\mathbf{A}$, $\mathbf{B}$ and $\mathbf{C}$, the vector $\mathbf{D} = (\mathbf{A}\cdot\mathbf{C})\mathbf{B} - (\mathbf{A}\cdot\mathbf{B})\mathbf{C}$ is orthogonal to $\mathbf{A}$.

b) Show that $\mathbf{D}$ as defined above vanishes if $\mathbf{B}$ and $\mathbf{C}$ are parallel.