# Assignment 2

Byungjoon Min, Quantum Mechanics II
(due date: September 18, 2018)

## 1 Pauli Matrices [30 pt]

The Pauli Matrices are a set of $2 \times 2$ complex matrices that describe the interaction of the spin of a particle with an external field. They are

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

Obtain the eigenvalues and eigenvectors of these three matrices. Also check the matrices are hermitian.

## 2 Gram-Schmidt Orthogonalization [10 pt]

Griffith Problem A. 4.

## 3 Matrix Diagonalization and Unitary Matrix [20 pt]

Consider the matrix

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

### 3.1 Eigenvalues and Eigenvectors

Find the eigenvalues and the normalized eigenvectors of the matrix $M$.

### 3.2 Unitary Matrix

Find the unitary matrix $U$ that diagonlizes $M$. Check the matrix is unitary.

### 3.3 Diagonalization

Show that $U^\dagger M U$ gives the diagonalized matrix.