5393 Quantum Mechanics
Homework 2

Reading Assignment	Sakurai	Chapter 1
Problems	Sakurai	Chapter 1 prob. 1.9, 1.11, 1.17, 1.18
Date Due		Sept. 7, 2021 *by* 5:00 pm

Additional Problems:

Q-1 The state space of a certain physical system is 3-dimensional. Let $\{|u_1\rangle, |u_2\rangle, |u_3\rangle\}$ be an orthonormal basis of this space. The kets $|\psi_0\rangle$ and $|\psi_1\rangle$ are defined by:

$$|\psi_0\rangle = \frac{1}{\sqrt{2}}|u_1\rangle + \frac{i}{2}|u_2\rangle + \frac{1}{2}|u_3\rangle$$
$$|\psi_1\rangle = \frac{1}{\sqrt{3}}|u_1\rangle + \frac{i}{\sqrt{3}}|u_2\rangle$$

(a) Are these kets normalized?

(b) Calculate the matrices $\tilde{\mathbf{P}}_0$ and $\tilde{\mathbf{P}}_1$ representing, in the above given basis set, the projection operators onto the state $|\psi_0\rangle$ and $|\psi_1\rangle$. Verify that the matrices are Hermitian.