5393 Quantum Mechanics
Homework 1

Reading Assignment	Sakurai	Sections 1.1 through 1.4
Problems	Sakurai	Chapter 1 prob. 1.1, 1.3, 1.7, 1.8
Date Due		Sept. 31, 2021 *by* 5:00 pm

Additional Problems:

Q-1 Let $\tilde{\mathbf{K}}$ be the operator defined by $\tilde{\mathbf{K}} = |\phi\rangle\langle\psi|$, where $|\phi\rangle$ and $|\psi\rangle$ are two vectors of the state space.

(a) Under what condition is $\tilde{\mathbf{K}}$ Hermitian?

(b) Calculate $\tilde{\mathbf{K}}^2$. Under what condition is $\tilde{\mathbf{K}}$ a projection operator?

(c) Show that $\tilde{\mathbf{K}}$ can always be written in the form $\tilde{\mathbf{K}} = \lambda\tilde{\mathbf{P}}_1\tilde{\mathbf{P}}_2$ where λ is a constant to be calculated and $\tilde{\mathbf{P}}_1$ and $\tilde{\mathbf{P}}_2$ are projection operators.