**Assignment - 3** Term: Winter 2022

Course: PHYS 304 - Introduction to Quantum Mechanics Instructor: Dr. Ke Zou

**Note: The solutions of the homework submitted need to include steps showing how to solve the problems.**

**Problem 1**

*Griffiths, Problem 2.4.* Calculate $< x >$, $< x^2 >$, $< p >$, $< p^2 >$, $\sigma_x$, and $\sigma_p$, for the $n$th stationary state of the infinite square well. Check that the uncertainty principle is satisfied. Which state comes closes to the uncertainty limit?

**Problem 2**

Obtain $\psi_n$, this is, the stationary states of the Schrödinger Equation, for a case with $V = 0$ if $-a < x < a$ and $V = \infty$ everywhere else.

**Problem 3**

*Griffiths, Problem 2.7.* A particle in the infinite square well has the initial wavefunction

$$\Psi(x,0) = \begin{cases} Ax, & 0 \leq x \leq a/2, \\ A(a-x), & a/2 \leq \leq a \end{cases}$$

a) Sketch $\Psi(x,0)$, and determine the constant $A$.
b) Find $\Psi(x,t)$.
c) What is the probability that a measurement of the energy would yield the value $E_1$?
d) Find the expectation value of the energy, using equation 2.21.

**Problem 4**

*Griffiths, Problem 2.8.* A particle of mass $m$ in the infinite square well (of width $a$) starts out in the state

$$\Psi(x,0) = \begin{cases} A, & 0 \leq x \leq a/2, \\ 0, & a/2 \leq \leq a \end{cases}$$

for some constant $A$, so it is (at $t = 0$) equally likely to be found at any point in the left half of the well. What is the probability that a measurement of the energy (at some later time $t$) would yield the value $\pi^2\hbar^2/2ma^2$?