**Homework 4**

**CS 518, Spring 2024**

Read class notes and chapter 3 P Lala (X, H, Y, Z gates).

1. a) What is X gate? Write circuit representation and matrix representation of X gate. Show the intermediatory and final output of a circuit when 3 X gates are in series (use both circuit and matrix representation of X gate)

b) If a qubit goes through a circuit of 2 X gate connected in series, what is the output of the circuit (show output at each stage)?

c) Write Qiskit code to manipulate |0> by Xgate (leverage sample code shared in the class lecture). Explain each line of the code. Submit the code on canvas and screen shots and also show TA that code works (the results) in the class (bring laptop to class)

1. a) What is Hadamard gate?
2. Write expression for mapping input |m> by a Hadamard gate (use class notes)
3. Write circuit and matrix representation of H gate.
4. Show the intermediatory and final output of a circuit when 3 H gates are in series (use both circuit and matrix representation of H gate) when initial input is a |0>.
5. Show the intermediatory and final output of a circuit when 3 H gates are in series (use both circuit and matrix representation of H gate) when initial input is a qubit.
6. Write Qiskit code to manipulate |0> by H gate. Submit the code on canvas and screen shots and also show TA that program works (the results) in the class (bring laptop to class)
7. Show the output of a circuit of X gate and H gate connected in series when the input is |1>. Show the output of each stage of the circuit.