1) Verify that |+> and |-> are eigenstates of X

Ans. All Pauli matrices eigenvalues are +1 and -1. Eigenvalues are [1/$\sqrt{(2)}$, 1/$\sqrt{(2)}$,] and [1/$\sqrt{(2)}$, -1/$\sqrt{(2)}$,]

2) What eigenvalues do they have?

Ans. All Pauli Matrices have eigenvalues +1 and -1.

3) Why would we not see these eigenvalues appear on the Bloch sphere?

Ans. The eigenvalues act as a global phase, hence they are not visualized on the Bloch Sphere

4) Find the eigenstates of the Y-gate, and their co-ordinates on the Bloch sphere.

Ans. Eigenvector are [1/$\sqrt{(2)}$, i/$\sqrt{(2)}$] and [1/$\sqrt{(2)}$, -i/$\sqrt{(2)}$]

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Coordinate on Bloch sphere = [0,1,0] and [0,-1,0]
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5) Write H gate as the outer products of |0>, |1>, |+>, |->

Ans. H = |+><0| + |-><1|

6) Write Y as a combination of H, X and Z gate(ignoring global phase)

Ans. Y = HZXH

7) If we initialise our qubit in the state |+>, what is the probability of measuring it in state |->?

Ans. 0. Since |+> = 1/$\sqrt{(2)}$ (|0> + |1>) whereas |-> = 1/$\sqrt{(2)}$ (|0> - |1>), hence it results in zero.

8) Use Qiskit to display the probability of measuring a |0⟩ qubit in the states |+⟩ and |−⟩

(Refer code file attached)

9) Try to create a function that measures in the Y-basis

(Refer code file attached)

10) What are the eigenstates of I gate?

Ans. Eignevalue is 1, and since I gate leaves all states unchanged, all states are eigenstates.