CS 5001 Homework - 3

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Due: April 19, 2024 (12 Noon CST)

Problem 1 (40 pts) Determine the angle and axis of rotations of the following unitaries : $X = \frac{1}{\sqrt{2}} \begin{bmatrix} -i & -1 \\ 1 & i \end{bmatrix}$ and $Y = \begin{bmatrix} 0 & 0 \\ -1 & i \end{bmatrix}$. Can you use these gates and the `CNOT` gate to create the `tofolli` gate?

Problem 2 (30 pts) Determine the axis and angle of rotations of e^{iH} and $\sqrt{H}$ where H is the Hadamard gate.

Problem 3 (30 pts) If the CHSH game were modified so that Alice and Bob aim to satisfy $a \vee b = x \oplus y$ instead, what classical and quantum strategies could they employ, and what would be their maximum winning probabilities?