Phys 31415 Homework #1

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Please do all the work on your own. Be curious and honest and prosperity shall be yours. If you have any questions seriously email me.

1 What to do

Create a new Jupyter notebook and import relevant packages i.e Qiskit at the very top cell. For each problem try to use a different cell or collection of cells to solve, this encourages you to write cleaner code and helps me grade it!

1. Create a quantum circuit with one qubit and one classical bit. Use the Hadamard gate once and take a measurement (at least 1024 shots) and plot a histogram of the results. What is the result? Explain briefly. (Remember unless otherwise specified all quantum circuits start in the $|0\rangle$ state.)
2. Create the same circuit as above in a different cell but do not measure it, instead print out the state vector. What is the result? Explain briefly.
3. Copy this code to create another one qubit plus one classical bit circuit, but initialized in the $|1\rangle$ state.
4. Repeat question 1 and 2 with this new circuit. What are the results? Explain briefly.
5. Can the histogram results alone distinguish between the $|+\rangle$ and $|-\rangle$ states? If not, how can we figure out the exact amplitudes of our states?

2 How to do it

1. You can start here to learn how to install Jupyter notebook and Qiskit.
2. You can also check out this for a quick skim over some basic Python.
3. Finally, here is where I show you how to do exactly what needs to be done for this assignment.

Please email me any questions you have and I will get them to ASAP. The more you try and ask questions, the more fun and fulfilling this course will be.