

# **Weekly Problem Set #6 – Week 6**

PLEASE SHOW ALL YOUR WORK FOR FULL CREDIT. Showing your work includes writing out intermediate steps in ways that others can understand or writing sentences that help to communicate your assumptions and logic. If you utilize any software tools or apps (e.g. Mathematica, Desmos, ChatGTP, etc.), you must transparently acknowledge your use of them in your HW submission. A subset of these problems will be graded for correctness. The rest of the problems will be graded for effort.

## **Part 0: Quantum Gates for Multiple Qubit Systems**

**Question 1 (5 pts). (Wong E4.17, anti-controlled-NOT acting on a 2-qubit system).** Show your work.

**Question 2 (5 pts). (Wong E4.19, Completeness of Bell basis).** Show your work.

**Question 3 (4 pts). (Wong E4.20, on Controlled-Z gate on 2-qubit system).** Show your work.

**Question 4 (6 pts). (Wong E4.24, on Toffoli gate).** Show your work.

**Question 5 (6 pts). (Wong E4.25, on No-cloning).** Show your work.

**Question 6 (6 pts). (Wong E4.33, on Universal sets of gates for quantum computing).** Show your work.