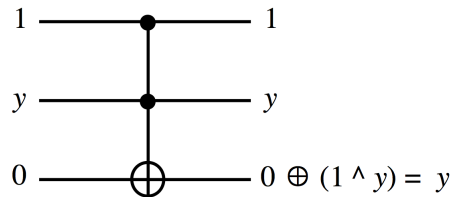


Assignment 16

Due by class time Tuesday, November 15

1. We can configure a Toffoli gate to perform a COPY operation on a classical bit y by setting the top input x to 1 and the bottom input z to 0, as shown in the diagram below:



- (a) Can we use this Toffoli gate configuration to copy a qubit in the superposition state $|y\rangle = \frac{1}{\sqrt{2}}|0\rangle + \frac{1}{\sqrt{2}}|1\rangle$? What 3-qubit output state *should* the gate produce if it were able to make two independent copies of $|y\rangle$?
 - (b) What output state does it *actually* produce?
2. Read section 6.1 of *Quantum Computing for Computer Scientists* (pages 170–179). As you read, work through Exercises 6.1.1, 6.1.2, and 6.1.3 on pages 172–173. You can check your answers in Appendix B of the book. You DO NOT need to turn in these three exercises, but we will go over them together in class next week.