

## Physics 140 – Week of November 5

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### Reading

For 11/7 – R&P §6.1.

1. I think we went over this in class, but say again how the  $C_{not}$  amounts to an XOR operation? And  $C_{not}$  is which special case of the Toffoli gate?
2. What did you find difficult or confusing about the reading? If nothing was particularly difficult, what was most interesting? Please be as specific as possible.

For 11/9 – no reading

For 11/12 – R&P §7.1.

1. Consider the last line on p. 128 and the sum

$$\frac{1}{\sqrt{N}} \sum |x\rangle |f(x)\rangle.$$

This is a highly compressed notation. For a given term in the sum, how many qubits are in  $|x\rangle$ ? How many in  $|f(x)\rangle$ ? (Hint – the answers are themselves variables. You might want to refer back to §6.1.) Given your answers, what is the range of decimal values for  $x$ ? For  $f(x)$ ?

2. What did you find difficult or confusing about the reading? If nothing was particularly difficult, what was most interesting? Please be as specific as possible.

### Problems

- In Figure 6.1 on p. 103 R&P present a full adder based on Toffoli gates and  $C_{not}$ s. Considering this as a classical circuit, write the equivalent construction using our logic gate notation (where, for example, AND looks like a bullet with two lines going in and one line going out). How is this similar to and how different than the full adder we used in our multiplication program? Where different, write out a table of the possible inputs and outputs to show that it works.

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As a reminder, reading responses are due in my email inbox ([ekb2@stmarys-ca.edu](mailto:ekb2@stmarys-ca.edu)) at 9:00 p.m. the night before class. Problem sets are due Monday at 4:00 p.m., in the manila envelope outside my office.