Chapter Summary — Logic

This document is a very rough summary of the the concepts and tasks that we covered in this chapter. The plan is to write a similar document at the end of each chapter, but time will tell (in fact it would be significantly better if you do this.).
I hope this document will be use to you when revising the chapter. However, please do not think that this comes with any guarantee of completeness — the probability of me overlooking something is large. Please ask if you think I have omitted anything.
— kmurphy, 29 Sept, 2018

Section A: Concepts

- ☐ **Propositions/statements**
  - ☐ Atomic vs compound
- ☐ **Fundmental logical connectives** — And, Or, Not
  - ☐ Definition as a rule, definition as a truth table, logic gate, and properties
  - ☐ Precedence order
- ☐ **Conditions logical connectives** — IfThen.
  - ☐ Definition as a rule, definition as a truth table
  - ☐ Representation using fundamental logical connectives
  - ☐ Implication and contrapositive vs converse and contrapositive of a converse
- ☐ **Bi-conditional logical connective** — IfAndOnlyIf.
  - ☐ Logical equivalence
- ☐ **Truth tables**
  - ☐ Satisfiability, tautologies, and contradictions
- ☐ **Existence and universal qualifiers**
- ☐ **Predicate logic — Logic expressions involving qualifiers**
  - ☐ Domain of discourse
- ☐ **Standard implications (see formula sheet)**
- ☐ **Arguments**
  - ☐ Valid arguments, premises and conclusion.

Section B: Tasks

- ☐ **Translating English $\longleftrightarrow$ Proposition/Predicate Logic**
  - ☐ Translate an English sentence into/from an expression involving atomic propositions and logical connectives.
  - ☐ Translate an English sentence involving existence and/or universal qualifiers into/from a logic expression involving qualifiers.
- ☐ **Logic Circuits**
  - ☐ Construct a logical expression to represent a logic circuit.
  - ☐ Draw a circuit to represent a proposition
  - ☐ Determine whether two circuits are equivalent via their associated logical expressions.
- ☐ **Truth Tables**
  - ☐ Construct a truth table of an expression.

- ☐ Determine whither expression is satisfiable, a tautology or a contradiction.
- ☐ Test whether an argument is valid.
- ☐ Test whether two expression are logically equivalent.

☐ **Predicate Logic — Qualifiers**

- ☐ Negate a proposition involving qualifiers.
- ☐ Prove/disprove

☐ **Arguments**

- ☐ Prove valid by constructing related expression and check for tautology.
- ☐ Prove using laws of inference.

Section C: Stuff not Covered (Yet)

You are probably asking "Why is this section here?". I have a number of reasons: 1) To highlight possible differences between this iteration of Discrete Mathematics and previous years. 2) To show those or you who are interested in more, where to go next. 3) To remind me of what I should do next, if miracles of miracles, we end up in week 11/12 with nothing to do but tell maths jokes ...

☐ **Other logical connectives.**

- ☐ NAND, NOR, XOR
- ☐ Universal logical connectives.

☐ **Properties of logical connectives (cover in more detail)**

☐ **Conversion to conjunctive normal form (CNF) and disjunctive normal form (DNF).**

☐ **Constructing Argument involving predicate logic (qualifiers)**