

CSE 311: Foundations of Computing I
Assignment #1
March 31, 2014
due: Monday, April 7, 1:30 p.m., *before lecture begins*

Bundles: The problems in each homework assignment will be divided into 2 groups (to facilitate distribution to grading TAs). You will turn in 2 corresponding bundles. Write your name in the *upper left corner* of each bundle's top page, with your last name printed clearly in CAPITAL LETTERS. Each bundle should be stapled separately. We don't supply the stapler.

This week's turnin bundles: (A) problems 1–4, (B) problems 5–8.

Textbook numbering labeled “6th edition” refers to the textbook's Sixth Edition. Numbering that is unlabeled refers to the Seventh Edition.

When asked for a short answer, also *show and explain your work* briefly.

1. Section 1.1, exercise 24 [6th edition: exercise 20], parts a, b, e, f, g.
2. State in English the converse and contrapositive of each of the following implications:
 - (a) If a is pushed onto the stack before b , then b is popped before a .
 - (b) If the input is correct and the program terminates, then the output is correct. (Be sure to use De Morgan's Law to simplify the contrapositive.)
3. Section 1.2, exercise 34. [6th edition: Section 1.1, exercise 62.] Be sure to include a list of compound propositions corresponding to the sentences of this word problem.
4. Section 1.3 [6th edition: Section 1.2], exercise 14. Do this by providing the truth table.
5. Section 1.2, exercise 8. [6th edition: Section 1.1, exercise 48.]
6. Section 1.3 [6th edition: Section 1.2], exercise 10d.
7. Section 1.3 [6th edition: Section 1.2], exercise 16. Use a truth table rather than following the confusing instructions preceding this exercise.
8. Section 1.3 [6th edition: Section 1.2], exercise 42. (Hint: Do exercise 41 as a warmup, and check your solution at the back of the textbook.) For full credit on exercise 42, it is not sufficient to give an example of the construction. You should describe the construction in its generality. To get you started, suppose the propositional variables are p_1, p_2, \dots, p_n and the compound proposition is f . Consider a line of the truth table of the form

p_1	p_2	\dots	p_n	f
v_1	v_2	\dots	v_n	T

where v_1, v_2, \dots, v_n are each either T or F. Corresponding to this line of the truth table, specify what conjunction of variables or their negations you will add to your formula. What about for each line of the truth table of the form

$$\left| \begin{array}{cccc|c} p_1 & p_2 & \cdots & p_n & f \\ \hline v_1 & v_2 & \cdots & v_n & F \end{array} \right| ?$$

(One of the reasons this exercise is important is that it demonstrates that any propositional formula can be expressed using only the connectives \neg, \wedge, \vee , and in fact in this very simple disjunctive normal form.)