CSE 311: Foundations of Computing I Assignment #2 April 7, 2014 due: Monday, April 14, 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 1–3, (B) problems 4–8.

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

- 1. Section 1.5 [6th edition: Section 1.4], exercise 10, parts c, d, e, h, i. You may not use the "uniqueness quantifier"; use only the usual universal and existential quantifiers.
- 2. Section 1.5 [6th edition: Section 1.4], exercise 30, parts c, e.
- 3. Section 2.2, exercise 16, part e [both editions]. Give a careful proof, using the format of proofs in lecture, with a justification for each line of your proof.
- 4. Section 1.5 [6th edition: Section 1.4], exercise 8, parts b and d.
- 5. Let Q(A, B) be the statement " $A \subseteq B$ ". If the universe of discourse for both A and B is all sets of integers, what are the truth values of the following? Give a brief justification for each of your answers.
 - (a) $\forall B \ Q(\{1,4\},B)$
 - (b) $\exists B \ Q(\{1,4\},B)$
 - (c) $\exists A \exists B Q(A, B)$
 - (d) $\forall A \exists B Q(A, B)$
 - (e) $\forall B \exists A Q(A, B)$
 - (f) $\exists A \forall B Q(A, B)$
 - (g) $\exists B \; \forall A \; Q(A, B)$
 - (h) $\forall A \; \forall B \; Q(A, B)$
- 6. Which of the following statements are true and which are false? Give a brief justification for each of your answers.
 - (a) $1 \in \{1, 2\}$
 - (b) $1 \subseteq \{1, 2\}$

- (c) $\{1\} \in \{1, 2\}$ (d) $\{1\} \subseteq \{1, 2\}$
- (e) $\phi \in \{1, 2\}$
- (f) $\phi \subseteq \{1, 2\}$
- (g) $\{\phi\} \subseteq \{1,2\}$
- 7. Section 2.1, exercise 32 [6th edition: exercise 28], parts c and d.
- 8. Carefully prove the following implication, using the format of proofs in lecture:

$$(A \cap B = A) \to (A \subseteq B).$$