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.


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) $\exists A \forall B Q(A, B)$
   (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) $\forall A \exists B Q(A, B)$

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) \( \emptyset \in \{1, 2\} \)
(f) \( \emptyset \subseteq \{1, 2\} \)
(g) \( \{\emptyset\} \subseteq \{1, 2\} \)

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:

\[(A \cap B = A) \rightarrow (A \subseteq B).\]