Section 2.1

Exercise 5

$\forall x\big(x \in A \leftrightarrow x \in B\big) \leftrightarrow A = B$

a) $A = B$ since A contains all elements of B and vice versa

b) $((1)) \in A \wedge ((1)) \in B$ but $(1) \notin A \rightarrow A \neq B$

c) $\emptyset$ is an empty set, and is not equal to a set containing an empty set.

Exercise 24

a) No. The power set of a set always include a set of an empty set: $P(\emptyset) = (\emptyset)$ meaning a power set of a set is never empty. $\forall A\big((\emptyset) \in P(A)\big) \rightarrow P(A) \neq \emptyset$

b) Yes. $P((a)) = (\emptyset, (a))$

c) No. $P((\emptyset, a)) = \big(\emptyset, (a), (\emptyset), (a, \emptyset)\big)$ The set in question is missing a $(\emptyset)$

d) Yes. $P((a, b)) = \big(\emptyset, (a), (b), (a, b)\big)$

Section 2.2

Exercise 18

c) $(A - B) \equiv \forall x \mid x \in A \wedge x \notin B$
$(A - B) - C \equiv \forall x \mid x \in (A - B) \wedge x \notin C$
$(A - B) - C \equiv \forall x \mid x \in A \wedge x \notin B \wedge x \notin C$
$(A - C) \equiv \forall x \mid x \in A \wedge x \notin C$
Since all elements of $(A - B) - C$ are in $(A - C)$, $(A - B) - C \subseteq (A - C)$

d) $(A - C) \equiv \forall x \mid x \in A \wedge x \notin C$
$(C - B) \equiv \forall x \mid x \in C \wedge x \notin B$
$(A - C) \cap (C - B) \equiv \forall x \mid x \in (A - C) \wedge x \in (C - B)$
$(A - C) \cap (C - B) \equiv \forall x \mid (x \in A \wedge x \notin C) \wedge (x \in C \wedge x \notin B)$
Rewriting the paranthesis we get
$(A - C) \cap (C - B) \equiv \forall x \mid x \in A \wedge \underbrace{(x \notin C \wedge x \in C)}_{x \in \emptyset} \wedge x \notin B$
Clearly, $(A - C) \cap (C - B) = \emptyset$

Exercise 46

Section 2.3

Exercise 12

a)

b)

Exercise 38

a)

b)

Exercise 42

a)

b)

Section 2.4

Exercise 12

a) c

b)

Exercise 33

a) d

b)

Section 2.5

Exercise 16

a)