SI Session 2: Basic Set Theory and More Proof Writing

1 Set Theory

1.1 Basic Grammar

Define: $A = \{1, 2, 3, \{3, 2\}, 2, 4\}; B = \{1, 2, 3\}; C = \{A, \{B\}, C\}$

1. True or false: $A \in B$

2. True or false: $B \in A$

3. True or false: $B \subseteq A$

4. True or false: $\{A\} \in C$

5. True or false: $\{B\} \in C$

6. True or false: $\emptyset \in C$

7. True or false: $\emptyset \subset C$

8. Something here does not make sense, find it.

1.2 Carteisan Product

Define: $K = \{red, blue, green\}; L = \{1, 2, 3\}$

9. Calculate: $K \times L$

10. Calculate: $L \times K$

11. Calculate: $|K|, |L|, |L \times K|$

2 Proof-Writing

Prove by induction:
$a_1 b_1 + ... + a_n b_n = (a_1 - a_2)b_1 + (a_2 - a_3)(b_1 + b_2) + ... + (a_{n-1} - a_n)(b_1 + ... + b_{n-1}) + a_n(b_1 + ... + b_n)$