Problem Set 4 – Due Tuesday, April 28, 2009: 3:15

- 1. [10] is the following true or false (justify your answer): $A = \emptyset \iff \mathcal{P}(A) = \emptyset$
- 2. [24] Which of the following conditions imply that B = C? In each case, either prove or give a counterexample.
 - (a) $A \cup B = A \cup C$
 - (b) $A \cap B = A \cap C$
 - (c) $A \oplus B = A \oplus C$
- 3. [24] Suppose that A, B and C are sets. For each of the following statements either prove it is true or give a counterexample to show that it is false.
 - (a) $(A \smallsetminus B) \cup C) = (A \smallsetminus B) \cup (A \smallsetminus C)$
 - (b) $(A \smallsetminus B) \times C = (A \times C) \smallsetminus (B \times C)$
 - (c) $(A \oplus B) \times C = (A \times C) \oplus (B \times C)$
- 4. [10]Write a regular expression for the language that is the set of all nonempty strings over $\{a, b\}$ that start and end with different characters. Make your regular expression as short as you can.
- 5. [12]Write a regular expression for the language that is the set of all strings over $\{a, b, c\}$ that have exactly two "c"'s. Make your regular expression as short as you can.
- 6. [14]Suppose L_1 and L_2 are regular languages, then is L_1L_2 also a regular language? Justify your answer.