Automata and Formal Languages
Homework Set 1
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shieng@ncnu.edu.tw

Due date: Sep. 24

Problem 1 Let A be the set $\{a, b\}$, and B be the set $\{a, b, c\}$.

1. Is A a subset of B?

2. Is B a subset of A?

3. What is $A \cup B$?

4. What is $A \cap B$?

5. What is $A \times B$?

6. What is the power set of B?

Problem 2 If A is a set with a elements, how many elements are in the power set of A? Explain your answer.

Problem 3

Let X be the set $\{1, 2, 3, 4, 5\}$ and Y be the set $\{6, 7, 8, 9, 10\}$. The unary function $f \colon X \longrightarrow Y$ and the binary function $g \colon X \times Y \longrightarrow Y$ are described in the following tables.

n	$f(n)$
1	6
2	7
3	6
4	7
5	6

g	6	7	8	9	10
1	10	10	10	10	10
2	7	8	9	10	6
3	7	7	8	8	9
4	9	8	7	6	10
5	6	6	6	6	6

a. What is the value of $f(2)$?
b. What are the range and domain of f?
c. What is the value of $g(2, 10)$?
d. What are the range and domain of g?
e. What is the value of $g(4, f(4))$?

Problem 4
Find the error in the following proof that 2=1.
Consider the equation $a = b$. Multiply both sides by a to obtain $a^2 = ab$. Subtract b^2 from both sides to get $a^2 - b^2 = ab - b^2$. Now factor each side, $(a + b)(a - b) = b(a - b)$, and divide each side by $(a - b)$, to get $a + b = b$. Finally, let a and b equal 1, which shows that $2 = 1$.