

CS 2800: Discrete Structures, Fall 2012

Homework 1

Due Friday, August 31, 2012

Please write your netid on the upper right corner of all pages. Grading for all problems will be based on neatness, style, and correctness.

1. For each of the following, if possible, give 4 examples of elements from each set.
 - a. $S = \{ab, c\}; T = \{e, fh, g\}; S \cdot T$
 - b. $A = \{3, 4, 5\}; \{1\}\{0^i | i \in A\}\{10\}^*$
 - c. $\{111, 01\}^*$
 - d. $S_1 = \{(0)^*(01)^*(101)^i 0^* | i \in N\}$
 - e. $S_2 = \{1^* 0^* 1(10)^{i+1} | i \in N\}$
 - f. $S_1 \cap S_2$
2. For each of the following, give a description of all of the possible elements of each set. Be sure to be specific and to mention all corner cases, if any exist.
 - a. $S = \{10^i 10^{i+1} | i \in N\}$
 - b. S^*
 - c. $S^* \cap 10S^*10^*$
 - d. $T = \{(0 + 2)^{i+5} | i \in N\}$
3. Prove that $\sqrt{6}$ is irrational.
4. Is the set of all pairs of integers countably infinite? Justify your answer.
5. Prove that the set of infinite strings of 0's and 1's is non-countably infinite.
6. In a concise way, give an explanation of countably infinite that a high school student could understand. Give an example of a set that is non-countably infinite and explain why. Please pick a set that has not been used in class, this assignment, or lecture notes.