CSCI 301 Homework 2

Name W#

If your work is handwritten, please make sure your handwriting is clean and readable. Unreadable homework will be returned ungraded.

1. True or False (10pts)
   1. The set {(1, 1), (2, 2), (3, 3), (2, 3)} is a function.
   2. Every regular language can be recognized by a deterministic finite automaton (DFA).
   3. The function 𝑓 : 𝑅 → 𝑅 defined by 𝑓 (𝑥) = 𝑥2+1 is surjective.
   4. Nondeterministic finite automata (NFA) are more powerful than DFAs in terms of the types of languages they can recognize.
   5. The function 𝑓 : 𝑅 → 𝑅 defined by 𝑓 (𝑥) = 𝑥3 − 𝑥 is injective.
   6. Every NFA can be converted into an equivalent DFA.
   7. Let R be the relation on the set {1, 2, 3, 4} such that R = {(1, 2), (2, 3), (3, 1)}. The relation R is both reflexive and symmetric.
   8. A given string from a regular expression can always be converted to a NFA.
   9. The relation R = {(a, b) | a is younger than b} on the set of all people. R is Reflexive.
   10. A DFA can use empty string (ε) transitions.
2. (10pts) Prove using mathematical induction that for all n ≥ 1,

1 + 4 + 7 + ... + (3n - 2) =

1. (10pts) Convert the following NFA to a DFA.

A diagram of a diagram

Description automatically generated

1. (10pts) Convert the following regular expression to an NFA.

bb(ab)\*aa

**Submission**

Please submit a PDF file to Canvas.