Computational Complexity - Pop Quiz I

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1 Instructions

(i) Attempt as many problems as you can.

(ii) Each question is worth 1 point.

2 Problems

1. Explain with examples, the similarities and differences between
   (a) Problems and Languages.
   (b) Problems and Algorithms.
   (c) Turing Machines and Algorithms.
   (d) Recursive and Recursively enumerable languages.
2. Let L_1 and L_2 denote two recursive languages defined over the alphabet $\Sigma = \{0, 1\}$. Assume that $L_1 \cap L_2 = \emptyset$. Are L_1 and L_2 recursively inseparable?
3. State and explain Rice's theorem.
4. Is it possible to design an algorithm that takes as input an algorithm **A** and returns **true** if **A** correctly computes the square of its input and **false** otherwise.
5. Convert the following formula into CNF and DNF:

$$\bar{x_1}x_2x_3 \vee (x_1\bar{x_2} \wedge (x_3 \vee x_1))$$