

I216 Computational Complexity and Discrete Mathematics Report (2)

2014, Term 2-1

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Propose(出題): October 27 (Mon)

Deadline(提出期限): October 30 (Thu), 10:50

Note(注意): Do not forget to handwrite your name, student ID, problems, and answers on your report.
(レポートには氏名, 学生番号, 問題, 解答を, すべて手書きで書くこと.)

Answer one of the following three problems. (以下の問題から1問選んで答えよ.)

Problem 1 (5 points): Determine if each of the following equations is correct or wrong. If it is correct, prove it. If it is wrong, disprove it. You can use l'Hospital's rule if you need it. (以下の式は正しいか. 正しいければ証明し, 間違っていれば反証せよ. 必要ならロピタルの定理を使ってもよい.)

1. $5n^2 + 3n + 8 = O(2n^2 + 1)$
2. $3n^3 + 4n^2 = O(n^2)$
3. $n^5 = O(1.5^n)$
4. $O(n^2) = O(n^3)$

Problem 2 (5 points): We define an equivalence relation \equiv_m^P as follows: (多項式時間還元可能性に関する同値関係 \equiv_m^P を次で定義した:)

$$A \equiv_m^P B \leftrightarrow A \leq_m^P B \text{ and } B \leq_m^P A$$

Prove that the relation \equiv_m^P is surely an equivalence relation. Precisely, you need to show that it is reflexive, symmetric, and transitive. (これが確かに同値関係になっていることを証明せよ. 具体的には, 反射律, 対称律, 推移律が成立することを示せばよい.)

Problem 3 (5 points): Each instance of the 3SAT is a propositional expression in conjunctive normal form such that each clause contains exactly 3 literals. Even if you replace this exactly by at most, the difficulty of the problems are not changed. Prove it. (3SATの入力は, CNF形式の命題論理式であり, それぞれの項は ちょうど3つのリテラルを含むのであった. ここでこの ちょうどを 高だかで置き換えたとしても, 問題の難しさは変わらない. これを証明せよ.)