

# Homework 2

September 6, 2007

The homework is due in class (during the first 10 minutes) on Thursday, 13th September (or before). The problems are from the book by Rosen, 6th edition (sections 1.3 and 1.4). As mentioned in the course syllabus, there are no electronic submissions and no late homeworks will be accepted unless you have an illness spanning the full period from the time the homework was assigned until it was due (and I shall need to see a medical practitioner's certificate to that effect). Standard academic honesty rules apply. You can discuss problems but the solutions turned in should be entirely your own. Cases of plagiarism will be dealt with strictly. **Also, make sure you write your name and section number on the first homework sheet and also staple all the sheets together.**

## 1 Translations

Note: Specify a proper domain of discourse in each case. For some of the statements, you will need to use a few propositions in addition to the propositional functions mentioned below.

1. Section (1.3): Problem 26  
[Use the following propositional functions as described below: 26(a):  $\text{HasVisited}(x)$  (which is true if 'x' has visited Uzbekistan), 26(b):  $\text{Calculus}(x)$  and  $\text{CPlusPlus}(x)$ , 26(c):  $\text{Bicycle}(x)$  and  $\text{Motorcycle}(x)$ , 26(d):  $\text{School}(x)$  and  $\text{IsHappy}(x)$ , 26(e):  $\text{School}(x)$  and  $\text{TwentiethCentury}(x)$ ]
2. Section (1.3): Problem 42  
[Use the following propositional functions as described below: 42(a):  $\text{HasAccessToElectronicMailBox}(x)$  and  $\text{User}(x)$ , 42(b):  $\text{InTheGroup}(x)$  and  $\text{MailBoxAccessible}(x)$ , 42(d):  $\text{Router}(x)$  and  $\text{FunctioningNormally}(x)$ ] (For 42(c), do you think we need quantifiers?)

## 2 Equivalences and inferences involving quantifiers

1. Section (1.3): 62
2. Section (1.3): 48(a)

3. Section (1.4): 49(a) [Hint: use distributive property of conjunctions or disjunctions]

### **3 More Translations (some with nested quantifiers)**

1. Section (1.4): 12(a), (d), (i), (j), (k), (m), (n)
2. Section (1.4): 13(l)

### **4 Counterexamples**

Section (1.4): 40(a),(b)

### **5 ★Quantifier of Unique Existentiality**

1. Section (1.4): 52 [Hint: Unique  $\mathbf{x}$  satisfying  $\mathbf{P}(\mathbf{x})$  means that there exists an element  $\mathbf{x}$  for which  $\mathbf{P}(\mathbf{x})$  is true *and* for every *other* element  $\mathbf{y}$  in the domain of discourse,  $\mathbf{P}(\mathbf{y})$  is false]
2. Translate 12(l) from Section (1.4). Note, the statement is: "There are EXACTLY TWO students in class who have not chatted with each other over the internet".

### **6 Practice Problems (solve them, but you need not submit them)**

Section (1.4): 32, 34, 38 and Section (1.3): 44