

Due: Friday, February 16, 2018

Name 1(Print) \_\_\_\_\_ CSE Login \_\_\_\_\_

Name 2(Print) \_\_\_\_\_ CSE Login \_\_\_\_\_

Problem	Page	Notes	Points	Score
A	n/a		5	
B	n/a		8	
1.7:30	91		6	
1.8:4	108		6	
1.8:21	108		3	
1.8:36 (bonus)	109		6	
2.1:2 (a,b)	125		2	
2.1:6	125		2	
2.1:10	125		7	
2.1:20	126		4	
2.1:24	126		6	
2.1:26	126	Give a formal proof	6	
2.1:32 (a, c)	126		4	
2.1:38	126	Give a formal proof	6	
2.1:40	126		5	
2.1:42 (a,c)	126		4	
2.1:44 (bonus)	126		3	
Typesetting (bonus)			7	
Total			74	

**Problem A:** Using contraposition, prove that

$$\forall x, y \in \mathbb{R}, x + y \geq 2, \text{ then } x \geq 1 \text{ or } y \geq 1.$$

**Problem B:** Write the following sentences in First Order Logic, first, declaring the UoD and the predicates, their arguments and meaning in English:

1. For every mall, there is some Santa who is at the mall.
2. Every child who visits anywhere talks with every Santa who is at the place visited. [Don't make a predicate for "the place visited;" it should just be a variable.]
3. Every child who is a city child visits some mall.
4. Every child who is good or who talks with some Santa gets some toy.

**Instructions** Follow instructions *carefully*, failure to do so may result in points being deducted.

- The homework must be submitted on paper. Homework *neatly* formatted in  $\text{\LaTeX}$  will receive a 10 percent bonus. When formatting in  $\text{\LaTeX}$ , submit both the .tex and .pdf files via handin, in addition to the hard copy. You will not receive the bonus points if you work with a partner (see below).
- Clearly label each problem and submit answers *in order*.
- Staple this cover page to the front of your assignment for easier grading.
- Late submissions *will not be accepted*
- When you are asked to prove something, you must give a formal, rigorous, and complete a proof as possible. Each step in your proof must contain explanation that would allow us to understand what theorem/logic you have applied to arrive at that step.
- You are to work individually, and all work should be your own. Check partner policy below.
- The CSE academic dishonesty policy is in effect (see [http://cse.unl.edu/ugrad/resources/academic\\_integrity.php](http://cse.unl.edu/ugrad/resources/academic_integrity.php)).

**Partner Policy** You may work in pairs, but you must follow these guidelines:

1. You must work *all* problems *together*. You may not simply partition the work between you.
2. You must use  $\text{\LaTeX}$  and you may divide the typing duties however you wish.
3. You may not discuss the problems with other groups or individuals.
4. Hand in only one hard copy with both author's names.