Due: By 12:00 noon on Thursday, October 11. **Worth**: 10%

You must complete and sign an assignment cover page, and attach it (with a staple) to the front of your assignment. Assignments should be handed into the drop box in BA 2220.

1. [15 marks] Consider the following Sudoku puzzle.

4		5					1	8
		7					2	
			6	1	3			
	9	6						
1			7		8			2
						1	3	
			2	4	5			
	3					2		
8	5					9		7

Recall that to complete a Sudoku puzzle, you must fill each space with a digit 1 through 9 such that each of the digits 1 through 9 appears exactly once in each row (across the puzzle), column (vertically in the puzzle), and indicated 3×3 region (there are 9 such regions). There is only one correct solution, so each space has only one correct answer.

(You may find more information on Sudoku puzzles on the Internet.)

   (a) [10 marks] Indicate, in order, the first 5 entries you fill in the puzzle. For each of these 5 entries, describe the reasoning that allowed you to fill in the entry.

   (b) [5 marks] Give the unique solution to this puzzle.

2. [9 marks] Consider the following statements:

   (S1) The Maple Leafs will make the playoffs only if they stay healthy.
   (S2) The fans will be happy if the Maple Leafs make the playoffs.

   (a) Express (S1) and (S2) symbolically. Clearly define any appropriate predicates and domains you require.

   (b) Express the contrapositive of (S1) and of (S2) both symbolically and in natural English.

   (c) Express the converse of (S1) and of (S2) both symbolically and in natural English.

   (d) Assume (S1) and (S2) are true. Suppose the Maple Leafs stay healthy. Are the fans happy? Justify your answer.

3. [15 marks] Consider the following database of pets:

Pet	Price	Soft	Cuddly
aardvark	50	no	no
bunny	5	yes	yes
cat	20	yes	yes
dobermann	100	yes	no
emu	150	yes	no

Formalize each of the following statements symbolically. Then determine which ones are true. Justify briefly, either by giving an appropriate example/counterexample, or by explaining for which pets you checked which property (give the names of the pets and their properties you checked).

(a) Pets costing less than 40 are soft and cuddly.

(b) Some pets are not soft.

(c) For a pet to be cuddly, it must be soft.

(d) No pets are both soft and cost more than 75.

(e) Pets that are cuddly and cost more than 75 are not soft.

4. [6 marks] Consider the statement:

(S3) There is a class clown.

This can be interpreted as meaning there is *at least one* class clown or as meaning there is *exactly one* class clown. Express each of these two interpretations of (S3) symbolically. Clearly define any appropriate predicates or domains you require.