## CSC 242

## **Knowledge Representation Using Logic**

## Answer all four questions below. Due date is MARCH 4<sup>th</sup>.

- 1. (25 points) Consider the following sentences:
  - John likes all kinds of food
  - Apples are food
  - Chicken is food
  - Anything anyone eats and isn't killed by is food
  - Bill eats peanuts and is still alive
  - Sue eats everything Bill eats
  - a. Translate these sentences into formulas in first order logic
  - b. Convert the formulas of Part a. into clause form
  - c. Use resolution to prove that John likes peanuts
  - d. Use resolution to answer the question, "What food does Sue eat?"
- 2. (25 points) Consider the following facts:
  - The members of the Elm St. Bridge Club are Joe, Sally, Bill, and Ellen
  - Joe is married to Sally
  - Bill is Ellen's brother
  - The spouse of every married person in the club is also in the club
  - The last meeting of the club was at Joe's house
  - a. Represent the facts in first-order logic
  - b. From the facts given above, most people would be able to decide on the truth of the following additional statement:
    - The last meeting of the club was at Sally's house

can you construct a resolution proof to demonstrate the truth of this statement given the five facts listed above? Do so, if possible. Otherwise, add the facts you need and then construct the proof.

- 3. (25 points) What is wrong with the following argument?
  - *Men are widely distributed over the earth*
  - Socrates is a man
  - Therefore, Socrates is widely distributed over the earth

How should the facts be represented by these sentences be represented in logic so that this problem does not arise?

a.

Written Assignment #1

Spring 1999

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4. (25 points) Suppose you are given the following facts:

$$\forall x, y, z.gt(x, y) \land gt(y, z) \Rightarrow gt(x, z)$$
  
 $\forall a, b.succ(a, b) \Rightarrow gt(a, b)$   
 $\forall x.\neg gt(x, x)$ 

and you want to prove that gt(5,2) is true. Consider the following attempt at a resolution proof:



b. What needs to be added to the resolution procedure to make sure that this does not happen?