CSC165 Tutorial #1

Exercises

Winter 2015

Work on these exercises *before* the tutorial. You don't have to come up with a complete solution, but you should be prepared to discuss them with your TA.

Here are two statements, **S1** and **S2**

S1: All pernicious humans are quixotic.

S2: Some quixotic humans are raffish.

Answer the questions below. There's no need to worry about the meanings of pernicious, quixotic, or raffish.

1. Draw a Venn diagram for each of the following cases. Use **X** to indicate that a region is empty and **O** to indicate that a region is **not** empty. Assume that U denotes the set of all humans. Define other sets that you need.
   - **S1** is true.
   - **S1** is false.
   - **S2** is true.
   - **S2** is false.
2. Suppose you can be sure that **S1** is true.
   - Does knowing that somebody is pernicious tell you whether or not they are quixotic?why?
   - Does knowing that somebody is quixotic tell you whether or not they are pernicious?why?
   - Does knowing that somebody is not quixotic tell you whether or not they are not pernicious?why?
   - Does knowing that somebody is not pernicious tell you whether or not they are quixotic?why?
3. Translate the following sentences into logical notation. Define all sets and predicate symbols that you use in the translations.
   - 0 is the smallest element of $\mathbb{N}$. ($\mathbb{N}$ denotes the set of natural numbers)
   - $\mathbb{N}$ has a smallest element.
   - $\mathbb{N}$ does not include a largest element.
   - Every integer number is between two integer numbers. ($\mathbb{Z}$ denotes the set of integer numbers)
   - Everyone is loyal to someone.
   - All Romans were either loyal to Caesar or didn't like him.
4. Translate the following sentences into English.
   - $\forall x \in \mathbb{N}, \exists y \in \mathbb{N}, successor(y, x)$.
   - $\forall x \in \mathbb{N}, x = 0 \vee \exists y \in \mathbb{N}, predecessor(y, x)$.
   - $\forall x \in \mathbb{N}, \neg successor(0, x)$.
   - $\forall x \in \mathbb{N}, \neg(x = 0) \vee \exists y \in \mathbb{N}, successor(x, y)$.