Homework Databases

Due February 5, 2020

1. Consider relations with the following schemas and set of functional dependencies. Answer the following questions for each:
   - what are the non-trivial FDs that follow from the given FD. Restrict yourself to FDs with single attributes on the right side.
   - What are the keys of the relation.
   - What are the superkeys that are not keys.

   1. $R(A, B, C, D)$ and $\{AB \rightarrow C, C \rightarrow D, D \rightarrow A\}$
   2. $S(A, B, C, D)$ and $\{A \rightarrow B, B \rightarrow C, B \rightarrow D\}$
   3. $T(A, B, C, D)$ and $\{AB \rightarrow C, BC \rightarrow D, CD \rightarrow A, AD \rightarrow B\}$
   4. $U(A, B, C, D)$ and $\{A \rightarrow B, B \rightarrow C, C \rightarrow D, D \rightarrow A\}$

2. Use the closure test to show the following rules for FDs:

   Augmenting left sides: If $A_1A_2 \ldots A_n \rightarrow B$ is an FD, if C is another attribute, then $A_1A_2 \ldots A_nC \rightarrow B$.

3. Show by example of a relation that the following implications are **wrong**:
   1. $A \rightarrow B$ implies $B \rightarrow A$
   2. $AB \rightarrow C$ and $A \rightarrow C$ imply $B \rightarrow C$