CMPS277 Principles of Database Systems Fall 2007

Homework Assignment 3

Due in class on November 6, 2007

1. Let $Q$ and $Q'$ be two conjunctive queries. Show that the problem of deciding whether there is a homomorphism (or containment mapping) from $Q'$ onto $Q$ is NP-complete.  

(*Hint:* Show your reduction with the 3-colorability problem.)

2. Prove or disprove the following statements:

   (a) Let $\Sigma = \{X \rightarrow Y, YW \rightarrow Z\}$ and let $\sigma = XW \rightarrow Z$. It is the case that $\Sigma \models \sigma$.

   (b) Let $\Sigma = \{X \rightarrow Y, Z \rightarrow Y\}$ and let $\sigma = XY \rightarrow Z$. It is the case that $\Sigma \models \sigma$.

3. Let $U$ be a set of attributes, and let $\Sigma$ and $\Gamma$ be sets of functional dependencies over $U$. Prove the following statements:

   (a) $\Sigma \subseteq \Sigma^*$

   (b) $(\Sigma^*)^* = \Sigma^*$

   (c) If $\Gamma \subseteq \Sigma$, then $\Gamma^* \subseteq \Sigma^*$.