COMP 280 : Assignment 10

due: Thursday, April 13, 2000

1. (4 pts) A simple airline database consists of a relation direct_flight(from_city, to_city). For each of the following queries over this database, either express it as a conjunctive query (no negation) or prove that it cannot be written as a conjunctive query.

   (a) There exists a route with only two stopovers from Houston to Paris.

   (b) All routes from Houston to Paris contain two stopovers.

2. (3 pts) An employee database contains a relation EmpInfo with attributes Name, Division, Manager, Office, and Extension. The database has a functional dependency from Division $\rightarrow$ Manager. If the database also has a functional dependency from Name $\rightarrow$ Manager, must it also satisfy a functional dependency from Name $\rightarrow$ Division? Provide a proof or a counterexample.

3. (14 pts) In class, we considered the film database query "pairs of actors and directors such that the actor appeared in a film directed by the director". One proposal was the conjunctive query

$$ans(Dir, Actor) \leftarrow Movies(Title, Dir, Actor),$$

   which we determined was incorrect because a single film might have multiple directors. Instead, we decided that the correct query is

$$ans(Dir, Actor) \leftarrow Movies(Title, Dir, Actor'), Movies(Title, Dir', Actor)$$

   (a) (3 pts) Consider a movie database with a functional dependency from Title $\rightarrow$ Director. Are the two above queries equivalent in this case? Prove your answer or provide a counterexample.

   (b) (3 pts) Consider a movie database with a join dependency
   Movies: $\bowtie$[{Title, Actor}, {Title, Director}]
   Are the two above queries equivalent in this case? Prove your answer or provide a counterexample.

   (c) (3 pts) Consider a movie database with a join dependency
   Movies: $\bowtie$[{Director, Title}, {Director, Actor}]
   Are the two above queries equivalent in this case? Prove your answer or provide a counterexample.

   (d) (5 pts) Consider a film database with a functional dependency Title $\rightarrow$ Director and a join dependency
   Movies: $\bowtie$[{Title, Actor}, {Title, Director}].
   Is either dependency redundant in the presence of the other? Specifically, does the functional dependency imply the join dependency or vice-versa? For each case, provide a proof or counterexample to justify your answer.