

Homework Assignment 2
(due Thursday, October 16, 2003)

- Exercises 3.5 part (h) only, 3.13, 3.14
- **Problem 1:** Recall the *beer drinkers* database consisting of information about drinkers, beers, and bars telling which drinkers like which beers, which drinkers frequent which bars, and which bars serve which beers and at what prices. In the previous homework assignment you had to give an appropriate relational database schema for this database.
 1. Give relational algebra expressions for the following queries:
 - (a) “List all bars that serve at least one beer that Joe Mug likes.”
 - (b) “List all bars that serve every beer that Joe Mug likes.”
 2. Give relational calculus expressions for the above two queries (you may use either domain or tuple relational calculus, but do not mix the two in the same answer).

- **Problem 2:** This problem is about the *semijoin* $R \bowtie S$ of two relations R and S , which is the relation consisting of all tuples in R that “contribute” to the join $R \bowtie S$. Semijoins play a useful role in database query processing and optimization.

More precisely, the *semijoin* $R \bowtie S$ of two relations R and S is the relation consisting of all tuples t in R such that there is at least one tuple in S that agrees with t in all attributes that R and S have in common.

Assume now that the attributes of R are A, B, C and the attributes of S are B, C, D . Give a relational algebra expression for $R \bowtie S$.

- **Problem 3:** In this problem the attributes of both R and S are A, B, C .

1. Give an example of two relations R and S such that

$$\pi_{A,B}(R - S) \neq \pi_{A,B}(R) - \pi_{A,B}(S).$$

2. Give an example of two relations R and S such that

$$\pi_{A,B}(R) \cap \pi_{A,B}(S) \neq \pi_{A,B}(R \cap S).$$

3. Determine whether the following statement is true or false: for every two relations R and S

$$\pi_{A,B}(R) \cup \pi_{A,B}(S) = \pi_{A,B}(R \cup S).$$

Justify briefly your answer.

- **Quiz Reminder:** The first quiz will take place on Thursday October 16 (4:00-4:25 p.m.)