

Homework Assignment 1

Due in class on January 21st 2004

- Exercise 4.4 from the textbook.
- Consider the relational schema $R(\underline{x}, y, z)$ $S(\underline{y}, \underline{w})$ and the two instances shown below:

R_1			S_1	
x	y	z	y	w
1	2	2	2	2
2	2	1	3	2
3	4	2	4	3
4	3	3	2	1
			5	4
			4	2

For each of the operations below, list three tuples that appear in the result and three tuples that do not. If the result contains less than three tuples, then list all the tuples in the result. Note that you should always be able to list three tuples that do not appear in the result.

- $R_1 \bowtie S_1$
- $S_1 / \pi_y(R_1)$
- $(\pi_y(R_1) \bowtie \sigma_{y=4}(S_1)) \cup (\pi_y(R_1) \bowtie_{y=w} \sigma_{y=5}(S_1))$
- $\pi_{y,z}(R_1) - S_1$
- $\pi_{y,x}(\rho_{1 \rightarrow y, 2 \rightarrow z, 3 \rightarrow x}(R_1)) \bowtie \rho_{2 \rightarrow x}(\sigma_{w > 2}(S_2))$

3. Consider a database that stores information on actors, the movies they appear in, and the producers of each movie. For each actor, the database records their name and their age; for each movie, its title, its year of release, and its genre; and for each producer, their name and the amount of money they have invested in the movie.

- Give a suitable relational schema for the above database. You do not have to write the definitions of tables in SQL, you can just give the schema in the notation used in the textbook. For every table, you need to underline the attributes in the primary key and write underneath any foreign key constraints (you can use the notation “ $R.x$ REFERENCES $S.y$ ” for a foreign key constraint from attribute x of relation R to attribute y of relation S).
- Write a relational algebra expression over the previous schema for each of the following queries:
 - Get the names of all actors that star in the movie “Shrek”.

- Get pairs of actor names that star in the same movie (note: the result should not contain pairs of the same actor name).
- Get the names of actors that starred in “action” films in 2003.
- List the names of actors that have starred in every movie that was released in 2003.
- List the titles of movies where all the producers have invested at least 10K.