1) Consider the employee database of figure below. Give an expression in the relational algebra to expresseach of the following queries:

employee (*person_name*, *street*, *city*)
works (*person_name*, *company_name*, *salary*)
company (*company_name*, *city*)

1. Find the ID and name of each employee who works for "BigBank".

$\Pi_{ID,person\_name}\ (\sigma_{company\_name="BigBank"}(works))$

2. Find the ID, name, and city of residence of each employee who works for "BigBank".

$\Pi_{ID,person\_name,city}\ (\sigma_{company\_name="BigBank"}(\sigma_{employee.ID=works.ID}\ (employee \times works)))$

3. Find the ID, name, street address, and city of residence of each employee who works for "BigBank" and earns more than $10000.

$\Pi_{ID,person\_name,street,city}\ (\sigma_{company\_name="BigBank"}$ A $salary > 10000\ (\sigma_{employee.ID=works.ID}$ $(employee \times works)))$

4. Find the ID and name of each employee in this database who lives in the same city as the company for which she or he works

$\Pi_{ID,person\_name}\ (\sigma_{employee.city=company.city}\ (employee\ \bowtie_{employee.ID=works.ID}$ $works \bowtie_{works.company\_name=company.company\_name}\ company)))$

2) Consider the employee database of figure above. Give an expression in the relational algebra to expresseach of the following queries:

1. Find the ID and name of each employee who does not work for " BigBank".

$\Pi_{ID,person\_name}\ (\sigma_{company\_name\neg="BigBank"}(works))$

2. Find the ID and name of each employee who earns at least as much as every employee in the database.

$\Pi_{\text{ID,person}\_name}\ (employee) - \Pi_{ID,person\_}\text{name}\ (\rho_A(employee) \bowtie_{A.salary<B.salary}\ \rho_B(employee))$

3) Consider the foreign-key constraint from the *dept_name* attribute of instructor to the *department* relation.Give examples of inserts and deletes to these relations that can cause a violation of the foreign-key constraint.

INSERT INTO instructor VALUES ('03039','Danik','DataBase.','77777');

DELETE FROM department WHERE dept_name='WebDev';

4) Consider the employee database of figure above. What are the appropriate primary keys?

For employee we can choose: **person_name;**

For works we can choose: **person_name, company_name;**

For company we can choose: **company_name;**