1.

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

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

- $\Pi_{\text{ID, person\_name, street, city}} \, (\sigma_{\text{(company\_name = "BigBank" } \cap \text{ salary > 10000\$)}} (\text{works}) \bowtie_{\text{works.ID = employee.ID}} (\text{employee}));$

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

2.

- $\Pi_{\text{ID, person\_name}} \, (\sigma_{\text{company\_name} \neq \text{"BigBank"}} (\text{works}));$
- $\Pi_{\text{ID, person\_name}} \, (\sigma_{\text{salary} \geq \text{MIN(salary)}} (\text{works}));$

3.

- Both instructor and department relations have "dept_name" attributes. If we insert in instructor schema data with non-existing dep_name in department, violation of foreign key occurs. For example, (45444, Aisha, Literature, 45000) causes violation, as Literature is not listed in department schema. Also, if we delete one dep_name from department: delete(Finance, Painter, 120000), it will be a violation because instructor has a person who works in that department.

4.

- Primary key is to identify the record, so ID can be primary key to:
- to distinguish people with the same name in employee and works tables;
- to identify the company name;