Homework: Chapter 2

2.1 Consider the following relational database

*employee(person\_name, street, city)*

*works(person\_name, company\_name, salary)*

*company(company\_name, city)*

1. What are the appropriate primary keys?
2. Given an expression in relational algebra to express each of the following queries.
   1. Find the names of all employees who live in city “Miami”.
   2. Find the names of all employees whose salary is greater than $100,000.
   3. Find the names of all employees who live in “Miami” and whose salary is greater than $100,000.
   4. Find the names of all employees who work for “First Bank Corporation”.
   5. Find the names and cities of residence of all employees who work for “First Bank Corporation”.
   6. Find the names, street address, and cities of residence of all employees who work for “First Bank Corporation” and earn more than $10,000.

2.2 Consider the following relational database

*classroom (building, room\_number, capacity)*

*department(dept\_name,building, budget)*

*course (course\_id, title, dept\_name, credits)*

*instructor (ID, name, dept\_name, salary)*

*section (course\_id, sec\_id, semester, year, building, room\_number, time, slot\_id)*

*teaches (ID, course\_id, sec\_id, semester, year)*

*student(ID, name, dept\_name, tot\_cred)*

*takes(ID, course\_id, sec\_id, semester, year, grade)*

*advisor(s\_ID, i\_ID)*

*time\_slot(time\_slot\_id, day, start\_time, end\_time)*

*prereq(course\_id, prereq\_id)*

1. What are the appropriate primary keys?
2. Given your choice of primary keys, identify appropriate foreign keys.
3. Consider the foreign key constraint from *dept\_name* attribute of *instructor* to the *department* relation. Give examples of inserts and deletes to these relations, which can cause a violation of the foreign key constraint.
4. In the instance of *instructor*, no two instructors have the same name, From this, can we conclude that *name* can be used as a superkey(or primary key) of *instructor*?
5. Consider the following expressions, for each expression, explain in words what the expression does.
   1. σ*year* >= 2009 (*takes*) *student*
   2. σ*year* >= 2009 (*takes* *student*)
   3. ∏*ID, name, course\_id*(*takes* *student*)