Use the Company relational model diagram to write relational algebra expressions to answer the following:

1. Find the SSN, first, and last names of all employees who have a dependent of the same sex.

   SAME ← σ $_{SEX = SEX}$ (EMPLOYEE ⋈ $_{SSN = ESSN}$ DEPENDENT)
   RESULT ← π $_{SSN, FNAME, LNAME}$ (SAME)

2. Find the project number and project name of every project worked on by a manager.

   MGR_WORKS_ON ← WORKS_ON ⋈ $_{ESSN = MGRSSN}$ DEPARTMENT
   MGR_PROJ ← MGR_WORKS_ON ⋈ $_{PNO = PNUMBER}$ PROJECT
   RESULT ← π $_{PNUMBER, PNAME}$ (MGR_PROJ)

   It's tempting here to join DEPARTMENT with PROJECT via the department number, but this only gives you the projects that are associated with a department, not actually worked on by someone who is a manager. This is why we need to keep the semantics firmly in mind when approaching these problems.

3. Find the SSN, first and last names of all employees who were born after their manager started managing the department they work for.

   EMP_DEPT ← EMPLOYEE ⋈ $_{DNO = DNUMBER}$ DEPARTMENT
   YOUNG_EMPS ← σ $_{BDATE < MGRSTARTDATE}$ (EMP_DEPT)
   RESULT ← π $_{SSN, FNAME, LNAME}$ (YOUNG_EMPS)

4. Find the project name and project number of all projects with the same location as one of their department locations.

   DEP_LOCS ← DEPT_LOCATIONS * DEPARTMENT
   DEP_PROJ_LOCS ← PROJECT ⋈ $_{DNUMBER = DNUM}$ DEP_LOCS
   SAME_LOCS ← σ $_{PLOCATION = DLOCATION}$ (DEP_PROJ_LOCS)
   RESULT ← π $_{PNAME, PNUMBER}$ (SAME_LOCS)

5. Find the SSN, first and last name of all employees who are not managers.

MGRS ← $\pi$ SSN, FNAME, LNAME (EMPLOYEE ⋈ SSN = MGRSSN DEPARTMENT)
ALL_EMPS ← $\pi$ SSN, FNAME, LNAME (EMPLOYEE)
RESULT ← ALL_EMPS – MGRS

It's very tempting here to think you can find managers by joining EMPLOYEE and DEPARTMENT on SSN <> MGRSSN. Since join is a cross product followed by a select, making the select condition an inequality joins every employee with every department they don't manage – all employees are in the result unless they are a manager of *every* department.