Below is a set of relations that may drive a company training database. Employees are assigned to a single location, and each have exactly one manager (with an obvious exception, the CEO). Each employee must register for and complete certain training courses. Each course is taught by another employee. An employee cannot register for a course for which he or she is the instructor. Employees prefer to train in locations the same as their own, but are not prohibited from travelling should the need arise. Use these relationships to answer the questions the following page.

Employee (EmpId, Fname, Lname, Gender, MgrId, LocId, EmailAddress)
Location (LocId, LocName, City, State)
Class (ClassId, Cname, InstructorId, LocId, TotHours)
TrainingStatus (EmpId, ClassId, Status)

Employee

EmpId	Fname	Lname	Gender	*MgrId*	*LocId*	EmailAddress
106	Petrina	Tillman	F	NULL	2	106@company.com
112	Alec	Wilhoit	M	106	1	112@company.com
117	Lourie	Johns	F	106	3	117@company.com
119	Florencio	Chaves	M	112	5	119@company.com
122	Tanya	Vanasse	F	112	5	122@company.com
127	Chana	Thorman	F	112	5	127@company.com
139	Geoffrey	Sjorgren	M	117	3	139@company.com
140	Gerardo	Borrego	M	117	3	139@company.com
142	Blain	Wishon	M	117	2	142@company.com
150	Danita	Lansford	F	122	2	150@company.com

Location

LocId	LocName	City	State
1	CoffeeTree	Seattle	WA
2	Evergreen	Tacoma	WA
3	Angelview	Los Angeles	CA
4	Pleasentville	San Diego	CA
5	Mile High	Denver	CO

Class

ClassId	Cname	*InstructorId*	*LocId*	TotHours
1001	Customer Service 101	119	5	10
1002	Finance Systems	119	5	20
1003	Conflict Management	112	1	10
1004	Building Relationships	117	3	25
1005	Management Essentials	112	1	40
1006	Office Relaxation	117	3	10
1007	How to Succeed	112	3	10

TrainingStatus

EmpId	*ClassId*	Status
106	1005	COMPLETED
106	1002	REGISTERED
106	1003	COMPLETED
112	1003	REGISTERED
112	1001	COMPLETED
117	1001	COMPLETED
117	1002	COMPLETED
127	1001	REGISTERED
127	1002	REGISTERED
127	1003	COMPLETED
139	1004	REGISTERED
139	1006	REGISTERED
142	1003	COMPLETED
142	1005	REGISTERED
150	1007	COMPLETED

Write relational algebra queries in **linear notation** (sec 2.1.13) that will return the results described below. Also, unless otherwise stated, draw the relation (in table form) that would be returned from each query.

Example:
Question: Write a query that returns the first and last names of female employees.
Answer:

$\pi_{Fname,\ Lname}(\sigma_{Genger='F'}(\text{Employee}))$

FName	**LName**
Petrina	Tillman
Lourie	Johns
Tanya	Vanasse
Chana	Thorman
Danita	Lansford

1) Write a query that returns the Course Name (Cname), Total Course Hours (TotHours), and City of all courses offered in Washington (WA).

2) Obtain the names (first and last) of employees that work directly for the CEO. The CEO is defined in this context as the Employee that does not have a Manager ID (MgrId IS NULL)

3) Write a query that returns a list of employees' first and last names, and the names of all of the courses they have completed.

4) Write a query that lists employees that have registered for (but not completed) courses that are held in a state different from that of the employee's location. Include the employee's first and last names, the employee's state, the course name and the course state in your results.

5) All managers are required to attend Management Essentials (with one exception, the instructor of the class). Write a query that will list all managers that have not registered for, nor completed the Management Essentials course, include their names and email addresses so they can be contacted to enroll in the course.