

- 4.18** For the database of Figure 4.12, write a query to find the ID of each employee with no manager. Note that an employee may simply have no manager listed or may have a *null* manager. Write your query using an outer join and then write it again using no outer join at all.

使用外连接：

```
select employee_name
from employee natural left outer join manages
where managers_name is null
```

不使用外连接：

```
select employee_name
from employee
where not exists
(select employee_name
from manages
where employee.employee_name=manages.employee_name and manages.manager_name is not null)
```

- 4.20** Show how to define a view *tot_credits* (*year*, *num_credits*), giving the total number of credits taken in each year.

```
create view tot_credits(year,num_credits) as(
  select year,num(credits)
  from takes natural join course
  group by year)
```

- 4.24** Suppose user *A*, who has all authorization privileges on a relation *r*, grants **select** on relation *r* to **public** with grant option. Suppose user *B* then grants **select** on *r* to *A*. Does this cause a cycle in the authorization graph? Explain why.

答：授权图中会出现环路，因为 A 将对 *r* 的选择权限通过 grant option 授予了公众 public，所以公众 public 可将选择权限授予任意其他用户。而 B 又将对 *r* 的选择权限授予 A，所以最终出现如下的环（见下页）：

