- 4.1

  这个查询是 2017 年春季教授本院开始课程的教师姓名和课程。因为自然连接会强制所有同名列相等连接，所以 instrcutor 的 dept_name 和 course 的 dept_name 进行了连接。

  另外，这个查询没有必要连接 section 表。

- 4.2

  a.

```sql
select id,case when sec_id is null then 0 else sec_id end sec_id
from instructor natural left outer join teaches
```

  b.

```sql
select id,(select case when sec_id is null then 0 else sec_id end
from teaches b where a.id = b.id)  sec_id
from instructor a
```

  c.

```sql
select case when id is null then '-' else id end id,
sec_id
from instructor natural right outer join teaches
where year = 2018 and semester = 'Spring'
```

  d.

```sql
select dept_name,count(id) cnt
department natural left outer join instructor
group by dept_name
```

- 4.5

  a.

  instructor:('1','Zhang San','Comp. Sci.',100000) teaches:('1','MA001','1','Spring',2017) course:('MA001','Python','Math',4)

  上述例子在 4.1.1 的错误查询中会被过滤掉。

  b. 比如，新建一个院系，但是这个院系暂时还没有教师与学生

  c. 比如，新来一个学生，他暂时还没有分到那个院。

- 4.6

```sql
create view student_grades(id,gpa) as
select id,sum(points*credits)/sum(credits)
from takes natural left outer join grade_points
natural left outer join course
group by id;
```

- 4.7

```
create table employee(
    id varchar(10) primary key,
    person_name varchar(30) not null,
    street varchar(30),
    city varchar(30)
);

create table company(
    company_name varchar(40) primary key,
    city varchar(30)
);

create table works(
    id vachar(10) primary key,
    company_name varchar(40) not null,
    salary number(10,2) not null,
    foriegn key company_name references company,
    foriegn key id references employee
);

create table managers(
    id varchar(10) primary key,
    manager_id varchar(10),
    foriegn key id references employee
    foriegn key nanagedr_id references employee
);
```

- 4.8

  a.

```
with ta as (select * from section natural join teaches)
select id,year,semester,course_id,sec_id
from ta
where (id,year,semester,time_slot_id) in (
select id,year,semester,time_slot_id
from ta
group by id,year,semester,time_slot_id
having count(*) > 1)
```

  b.

```
create assertion a1
```

```
check(not exists
    (select 1 from section natural join teaches
        group by id,year,semester,time_solt_id
        having count(*) >1
    )
)
```

- 4.9

  会导致被删除的这个人，及其直接或间接管理的所有人都被删除。

- 4.14

  原查询并不需要 section 中独有的教室和上课时间信息。

- 4.15

```
select *
from section join classroom using(building,room_number)
```

- 4.16

```
select id
from student natural left outer join takes
group by id
having count(course_id) = 0
```

- 4.17

```
select id
from student a left outer join advisor b on (a.id = b.i_id)
where i_id is null
```

- 4.18

```
select id
from employee natural join mananger
where manager_id is null;
```

- 4.20

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

- 4.24

  授权上是构成环，因为有用户 A 对于 public 的授权，和用户 B 对于 A 的授权，构成环。不过因为 A 本身是 r 的拥有者，所以哪怕 B 收回对 A 的授权，也不会影响 A 用户对于 r 的权限。