一、关系模式如下：（第 2 章关系代数作业题）

- 职工 E（ename， eno， bdate， addr， salary， dno）
  姓名 工号 出生日期 家庭地址 工资 所在部门编号
- 部门 D（dname， dno， mgreno）
  部门名称 部门编号 部门负责人的工号
- 项目 P（pname， pno， city， dno）
  项目名称 项目编号 所在城市 主管部门编号
- 工作 W（eno， pno， hours）
  职工工号 项目编号 工作时间
- 职工家属 Depend（eno， name， sex）
  职工工号 家属的姓名 家属的性别

请用 SQL 语言来表示下述数据查询操作。

1) 检索所有部门负责人的工号和姓名；

答案 1：select eno, ename from E, D where E.eno=D.mgreno;

答案 2：select eno, ename from E where eno IN (select mgreno from D);

答案 3：select eno,ename from E where exists(select * from D where E.eno=D.mgreno);

说明：在 SQL 语言中，‘多表连接查询’有表连接查询（答案 1）、使用 IN 谓词的嵌套查询（答案；2）、使用 EXISTS 谓词的嵌套查询（答案 3）等多种表示形式，以下的例子中就不再一一给出了。

2) 检索职工 Smith 所参与的项目的编号和名称；

```
select   pno, pname
from   E, W, P
where   ename=‘Smith’ and E.eno=W.eno and W.pno=P.pno ;
```

3) 检索拥有两个或两个以上家属的职工的姓名；

答案 1：
```
select   ename
from   E,   Depend D1,   Depend D2where E.eno=D1. eno and D1. eno=D2. eno
and D1.name<>D2.name;
```

答案 2：
```
select   ename
from   E,   (select eno, count(*) as d_count from Depend group by eno) as X
where   E.eno=X.eno   and   X.d_count>=2;
```

答案 3：
```
select   ename   from   E
where   2 <= ALL (select   count(*)   from   Depend X   where   X.eno=E.eno);
```

(说明：在答案 3 中，也可以用 SOME 或 ANY 来代替谓词 ALL）

注意点：有可能会出现如下的错误答案（原因：select 和 group by 中的属性不一致）

```
select   ename
from   E, Depend
where   E. eno = Depend. eno
group by   E.eno
having   Count(*) >= 2 ;
```

4) 检索不带家属的职工的姓名；

```
select  ename  from  E  where  eno  NOT IN  ( select  eno  from  Depend );
```

5) 检索参加过‘p2’号项目的职工的工号；

```
select  eno  from  W  where  pno='p2';
```

6) 检索只参加过‘p2’号项目的职工的姓名；

答案1：
```
select  ename  from  E,  W  W1
where  E.eno=W1.eno  and
       E.eno NOT IN (select W2.eno from W W2 where W2.pno<>'p2');
```

答案2：
```
select  ename  from  E, W  W1
where  E.eno=W1.eno  and
       NOT EXISTS ( select *  from  W  W2
                    where  W2.pno<>'p2'  and  W2.eno=E.eno );
```

7) 检索只参加过一个项目的职工的姓名；

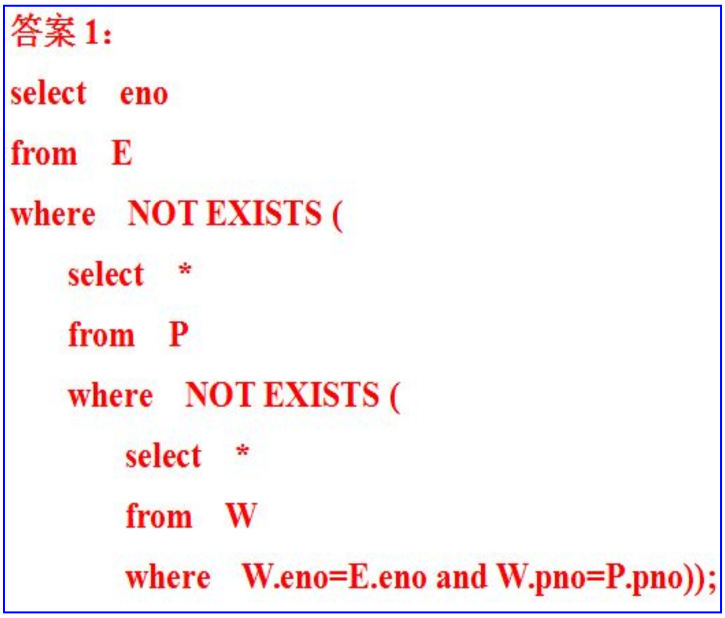
答案1：
```
select  ename  from  E
where 1=some (select count(distinct pno)  from W  where W.eno=E.eno);
```

答案2：
```
select  ename
from E, (select eno, count(distinct pno) as pnumber from W group by eno) X
where  E.eno=X.eno  and  X.pnumber=1;
```

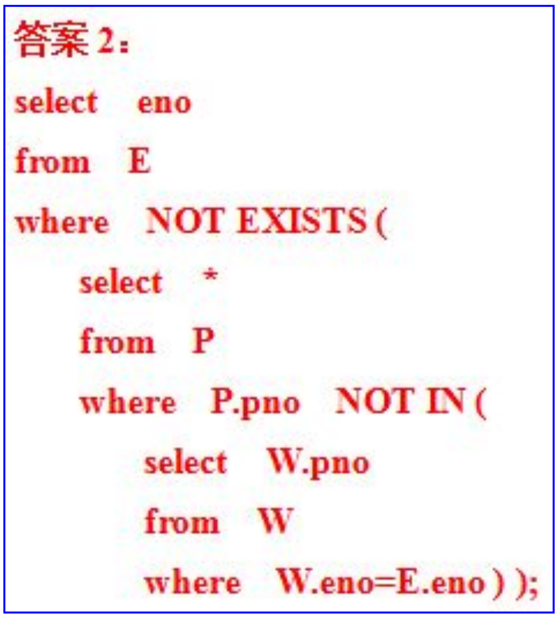
答案3：
```
select  ename  from  E,  W
where  E.eno=W.eno  and  E.eno  NOT IN (
       select X.eno from W X, W Y where X.eno=Y.eno and X.pno<>Y.pno);
```

注意点：参见第3）小题。

8) 检索参加了所有项目的职工的工号；

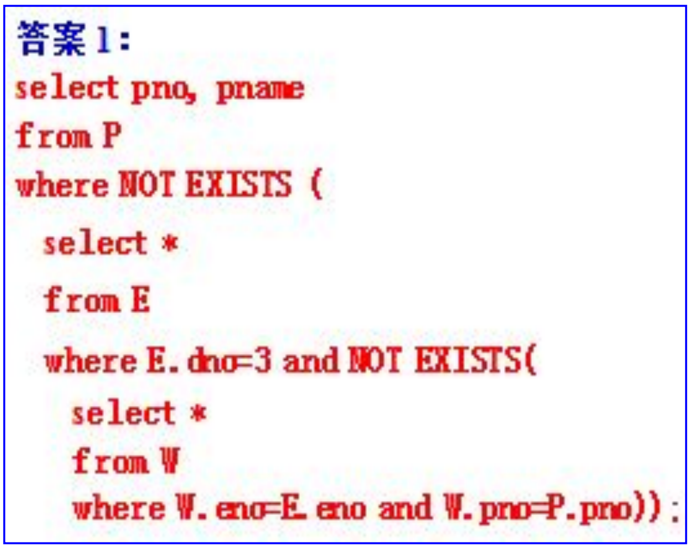


答案1：
```
select  eno
from  E
where  NOT EXISTS (
    select  *
    from  P
    where  NOT EXISTS (
        select  *
        from  W
        where  W.eno=E.eno and W.pno=P.pno));
```



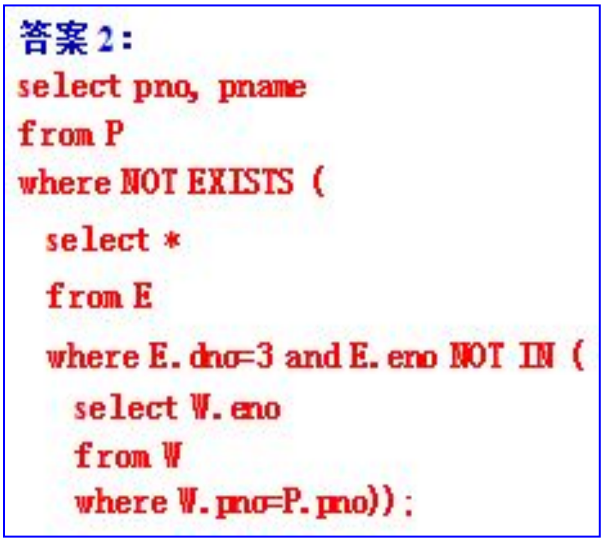
答案2：
```
select  eno
from  E
where  NOT EXISTS (
    select  *
    from  P
    where  P.pno  NOT IN (
        select  W.pno
        from  W
        where  W.eno=E.eno ) );
```

9) 检索全体 3 号部门的职工都参加了的项目的编号和名称；



答案1:

```
select pno, pname
from P
where NOT EXISTS (
  select *
  from E
  where E.dno=3 and NOT EXISTS(
    select *
    from W
    where W.eno=E.eno and W.pno=P.pno));
```



答案2:

```
select pno, pname
from P
where NOT EXISTS (
  select *
  from E
  where E.dno=3 and E.eno NOT IN (
    select W.eno
    from W
    where W.pno=P.pno));
```

10) 检索工资收入最高的职工的姓名；

```
答案 1：select E1.ename from E E1 where E1.salary IN (select max(salary) from E);
答案 2：select E1.ename from E E1 where E1.salary>=ALL(select salary from E);
答案 3：  select   E1.ename   from   E   E1
          where   NOT EXISTS (select *   from E E2   where E2.salary>E1.salary);
答案 4：  select   E1.ename
          from   E E1,  (select   max(salary) as max_sal   from   E)   X
          where   E1.salary=X.max_sal;
```

11) 查询每一个部门中工资收入最高的职工，结果返回部门编号以及该部门中工资收入最高的职工的工号。

```
答案 1：  select E1.dno, E1.eno   from E E1
          where   E1.salary IN (select max(E2.salary) from E E2 where E2.dno=E1.dno);
答案 2：  select E1.ename   from E E1
          where   E1.salary>=ALL(select E2.salary from E E2 where E2.dno=E1.dno);
答案 3：  select   E1.ename   from   E   E1   where   NOT EXISTS (
                select * from E E2 where E2.salary>E1.salary and E2.dno=E1.dno);
答案 4：  select   E1.ename
          from   E E1, (select dno, max(salary) as max_sal from E group by dno)   X
          where   E1.salary=X.max_sal and E1.dno=X.dno;
```

二、假设存在如下的关系模式（exercise 3.11）：

Customers (cid, cname, city, discnt)Agents (aid, aname, city, percent)
Products (pid, pname, city, quantity, price)
Orders (ordno, month, cid, aid, pid, qty, dollars)

请用 SQL 语言来表示下述数据操作要求。

(a) For each agent taking an order, list the product pid and the total quantity ordered by all customers from that agent.(检索每个经销商销售每一种产品的总数量)

```
select    aid, pid, sum(qty)
from     orders
group by    aid, pid;
```

(b) We say that a customer x orders a product y in an average quantity A if A is avg(qty) for all orders rows with cid=x and pid=y. Is it possible in a single SQL statement to retrieve cid values of customers who order all the products that they receive in average quantities (by product) of at least 300?（*检索符合下述要求的客户的编号：*在该客户订购过的所有商品中，每一种商品的平均每笔订单的订购数量均达到或超过 **300**）

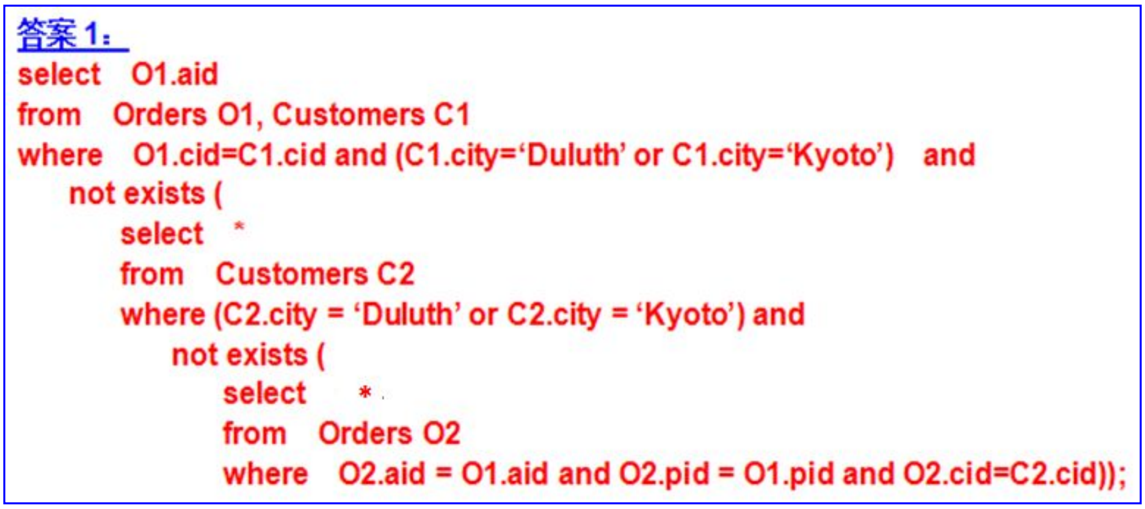
```
select    T.cid
from     ( select    cid, pid, avg(qty) as q_avg
              from    Orders
              group by    cid, pid )    T
group by    T.cid
having    min(T.q_avg) >= 300;
```

(c) Get aid values of agents not taking orders from any customer in Duluth for any product in Dallas.（*检索符合下述要求的经销商的编号*：没有为居住在 **Duluth** 的任何客户订购过任何位于 **Dallas** 的商品）

```
select    aid
from     agents
where    aid    not in    (
         select    aid
         from    Customers C, Products P, Orders O
         where    C.cid=O.cid and P.pid=C.pid and C.city=‘Duluth’ and P.city=‘Dallas’);
```

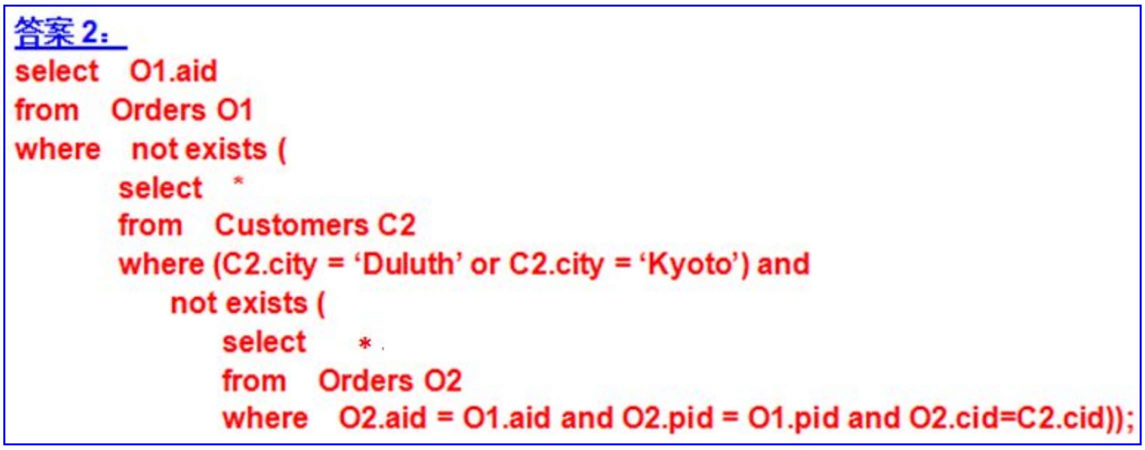
说明：也可以用两个子查询进行减法运算（**EXCEPT**）。

(d) **Get aid values of agents who order at least one common product for each customer who is based in Duluth or Kyoto.**（检索为居住在 **Duluth** 和 **Kyoto** 的所有客户订购过同一种商品的经销商的编号）



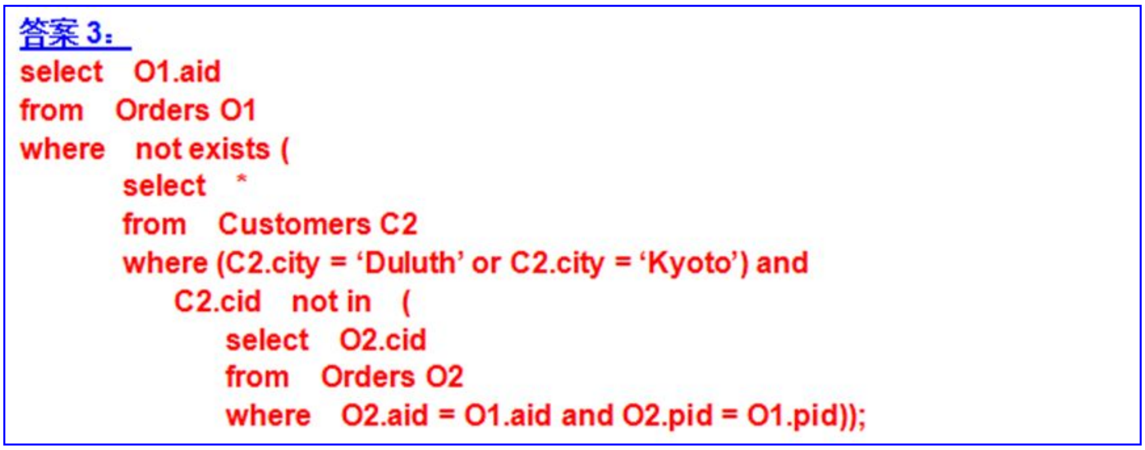
答案 1：

```
select   O1.aid
from   Orders O1, Customers C1
where   O1.cid=C1.cid and (C1.city='Duluth' or C1.city='Kyoto')   and
     not exists (
          select   *
          from   Customers C2
          where (C2.city = 'Duluth' or C2.city = 'Kyoto') and
               not exists (
                    select    *
                    from   Orders O2
                    where   O2.aid = O1.aid and O2.pid = O1.pid and O2.cid=C2.cid));
```



答案 2：

```
select   O1.aid
from   Orders O1
where   not exists (
          select   *
          from   Customers C2
          where (C2.city = 'Duluth' or C2.city = 'Kyoto') and
               not exists (
                    select    *
                    from   Orders O2
                    where   O2.aid = O1.aid and O2.pid = O1.pid and O2.cid=C2.cid));
```



答案 3：

```
select   O1.aid
from   Orders O1
where   not exists (
          select   *
          from   Customers C2
          where (C2.city = 'Duluth' or C2.city = 'Kyoto') and
               C2.cid   not in   (
                    select   O2.cid
                    from   Orders O2
                    where   O2.aid = O1.aid and O2.pid = O1.pid));
```

说明：

1）答案 **1** 和答案 **2** 的区别只在第一层的子查询，答案 **1** 有点复杂化了；

2）答案 **2** 和答案 **3** 的区别在第三层子查询，使用的分别是 **NOT EXISTS** 和 **NOT IN** 这两个不同的谓词，请仔细区分它们在表示形式上的区别。

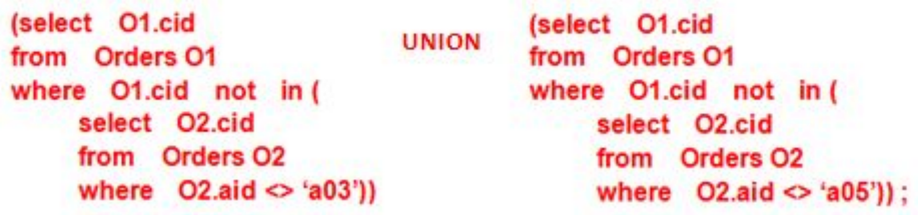
(e) Get cid values of customers who make orders only through agent a03 or a05.（检索满足下述条件的客户的编号：仅通过 a03 号经销商或 a05 号经销商订购过商品）

说明：根据对查询在语义理解上的不同，本题可以有不同的写法。例如：

答案 1：仅通过 a03 和 a05 这两个经销商中的一个或两个购买过产品的客户。

```
select   O1.cid
from    Orders O1
where   O1.cid   not   in (
            select   O2.cid
            from    Orders O2
            where   O2.aid <> ‘a03’ and O2.aid <> ‘a05’);
```

答案 2：仅通过 a03 和 a05 这两个经销商中的‘一个’购买过产品的客户。



```
(select   O1.cid
from   Orders O1
where   O1.cid   not   in (
        select   O2.cid
        from   Orders O2
        where   O2.aid <> ‘a03’))
UNION
(select   O1.cid
from   Orders O1
where   O1.cid   not   in (
        select   O2.cid
        from   Orders O2
        where   O2.aid <> ‘a05’)) ;
```

(f) Get pid values of products that are ordered by all customers in Dallas.（检索居住在 Dallas 的所有客户都订购过的商品编号）

```
select   pid   from   Products P
where   not exists (
            select   *   from   Customers C
            where   C.city = ‘Dallas’   and   not exists (
                select   *   from   Orders O
                where   O.pid=P.pid   and   O.cid=C.cid ) );
```

(g) Find agents with the highest percent (percent commission), using the max set function.（检索享有最高佣金比率的经销商的编号（使用 MAX 统计函数））

```
select   *
from   Agents
where   percent   IN   ( select   max(A1.percent)   from   Agents   A1 );
```

(h) In the agents table, delete the row with the agent named Gray, print out the resulting table in full, then put Gray back, using the Insert statement.（在 agents 表中进行下述操作：1）删除名字为 Gray 的供应商元组；2）查出在上述删除操作执行后的 agents 表中的所有内容（使用 SELECT 查询命令）；3）使用 Insert 命令将被删除的供应商 Gray 元组再插入到 agents 表中；4）使用 COMMIT 命令提交上述所有的操作结果。）

```
Delete   from   Agents   where   aname = ‘Gray’;
(其它操作略)
```

(i) Use the Update statement to change Gray’s percent to 11. Then change it back.（在 agents 表中执行下述操作：1）将供应商 Gray 的 percent 值修改为 11；2）使用 ROLLBACK 命令撤销修改。）

```
Update   Agents   Set   percent = 11   where   aname = ‘Gray’;
Rollback;
```

(j) Use a single Update statement to raise the prices of all products warehoused in Duluth or Dallas by 10%. Then restore the original values by rerunning the procedure that you originally used to create and load the products table.（使用一条 UPDATE 命令，将保存在 Duluth 和 Dallas 的所有商品的单价 prices 提升 10%，然后用 ROLLBACK 命令撤销修改。）

```
Update   Products
Set   price = price * 1.1
where   city =  ‘Duluth’   or city = ‘Dallas’;
Rollback;
```

(k) Write an SQL query to retrieve cid values for customers who place at least one order, but only through agent a04. On the same line with each cid, your query should list the total dollar amount of orders placed.（检索仅仅通过 a04 号经销商订购过商品的客户编号，并给出每个客户的订购总金额）

```
select   cid,   sum(dollars)
from   Orders
where   cid   not in   (select O1.cid   from Orders O1   where O1.aid<>‘a04’)
group by   cid;
```

(l) Write an SQL query to get aid and percent values of agents who take orders from all customers who live in Duluth. The aid values should be reported in order by decreasing percent. (Note that if percent is not retrieved in the select list, we cannot order by these values.) (检索为居住在 Duluth 的所有客户订购过商品的经销商的编号及其佣金百分比，并按照佣金百分比的降序输出查询结果）

```
select   aid, percent   from   Agents A
where   not exists (
            select   *   from   Customers C
            where   C.city = ‘Duluth’   and   not exists (
                        select   *   from   Orders O
                        where   O.aid = A.aid   and   O.cid=C.cid ))
Order by   percent   desc;
```

(m) Write an SQL query to get pid values of products ordered by at least one customer who lives in the same city as the agent taking the order.（*检索符合下述条件的商品的编号：*至少有一个客户通过与该客户位于同一个城市的经销商订购过该商品）

```
select   O.pid
from   Orders O, Customers C, Agents A
where   O.cid = C.cid and O.aid = A.aid and C.city = A.city;
```

说明：多表连接查询也可以用嵌套查询来表示。