

Problem 1

1. $\text{union}(x,y,z):-r(x,y,z).$

$\text{union}(x,y,z):-s(x,y,z).$

2. $\text{intersect}(x,y,z):-r(x,y,z), s(x,y,z).$

3. $\text{sub}(x,y,z):-r(x,y,z), \text{NOT } s(x,y,z).$

4. $\text{union}(x,y,z):-r(x,y,z).$

$\text{union}(x,y,z):-s(x,y,z).$

$\text{subtraction}(x,y,z):-\text{union}(x,y,z), \text{NOT } t(x,y,z).$

5. $\text{subOne}(x,y,z):-r(x,y,z), \text{NOT } s(x,y,z).$

$\text{subTwo}(x,y,z):-r(x,y,z), \text{NOT } t(x,y,z).$

$\text{intersection}(x,y,z):-\text{subOne}(x,y,z), \text{subTwo}(x,y,z).$

6. $\text{proj}(x,y):-r(x,y,z).$

7. $\text{proj}(x,y):-r(x,y,z).$

$u(x,y):-s(x,y,z).$

$\text{int}(x,y):-\text{proj}(x,y), u(x,y).$

Problem 2

1. $p(x,y,z):-r(x,y,z), s(x,y,z), x=y.$

2. $p(x,y,z):-r(x,y,z), s(x,y,z), x<y, y<z.$

3. $p(x,y,z):-r(x,y,z), s(x,y,z), x<y.$

$p(x,y,z):-r(x,y,z), s(x,y,z), y<z.$

4. $p(x,y,z):-r(x,y,z), s(x,y,z), \text{NOT } x<y, \text{NOT } x>y.$

Problem 3

$\pi \rho \sigma \bowtie$

1. $\pi_{q.x, r.y}(\sigma_{q.z=r.z}(q \bowtie r))$
2. $\pi_{q1.x, q2.y}(\rho_{q1(x,y)} \bowtie \rho_{q2(x,y)})$
3. $\pi_{q.x, r.y}(\sigma_{q.z=r.z \wedge q.x < r.y}(q \bowtie r))$

Problem 4

```
CREATE TABLE parent(  
X varchar(30),  
Y varchar(30)  
);
```

```
WITH RECURSIVE ancestor(X,Y) AS (  
    SELECT X,Y from PARENT  
    UNION ALL  
    SELECT P.X, A.Y  
    from PARENT P, ANCESTOR A  
    where P.Y = A.X  
)  
SELECT X,Y  
FROM ancestor;
```