CS 143 HW # 1 Junhong Wang (504941113)

1.

R − S is

A	B	C
4	5	6
1	2	6

S − R is

A	B	C
2	5	4

So,

(R − S) ∪ (S − R) is

A	B	C
4	5	6
1	2	6
2	5	4

2.

$R \bowtie_{R.A < S.C \wedge R.B < S.D} S$

A	R.B	S.B	C	D
1	2	2	4	6
1	2	8	6	8
1	2	7	5	9
3	4	2	4	6
3	4	8	6	8
3	4	7	5	9
5	6	8	6	8

3

(a) $\Pi_{customer\text{-}name}(\sigma_{branch\text{-}name = 'Region12'}(Account))$

(b) $\Pi_{customer\text{-}name}(\sigma_{Branch.city <> T.city \wedge Branch.branch\text{-}name = T.branch\text{-}name}(Branch \times \rho_T(Customer \bowtie Account)))$

(c) $\Pi_{branch\text{-}name}(Branch) - \Pi_{branch\text{-}name}(Account)$

(d) $\Pi_{customer\text{-}name}(Customer) - \Pi_{customer\text{-}name}(\sigma_{branch\text{-}name = 'Region12'}(Account))$

(e) $\Pi_{customer\text{-}name}(Account \div \Pi_{branch\text{-}name}(\sigma_{city='Los\ Angeles'}(Branch)))$

(f) $\Pi_{custome\text{-}name}(Account)$

$- \Pi_{customer\text{-}name}(\sigma_{(A1.account\text{-}number <> A2.account\text{-}number \vee A1.branch\text{-}name <> A2.branch\text{-}name) \wedge A1.customer\text{-}name = A2.customer\text{-}name}(\rho_{A1}(Account) \times \rho_{A2}(Account)))$

4.

$$\Pi_{sid}(Student) - \Pi_{S1.sid}\left(\sigma_{S1.GPA > S2.GPA \wedge S1.sid <> S2.sid}\left(\rho_{S1}(student) \times \rho_{S2}(student)\right)\right)$$

5.

$$\Pi_{customer\text{-}name}(Customer) - \Pi_{customer\text{-}name}\left(\Pi_{customer\text{-}name}(customer) \times \Pi_{branch\text{-}name}\left(\sigma_{city='Los Angeles'}(Branch)\right) - \Pi_{customer\text{-}name, branch\text{-}name}(Account)\right)$$

6. Let $R(A,B) \div S(B) = Q(A)$

Then $Q(A)$ is the largest relation that satisfies the following property : $Q(A) \times S(B)$ is a subset of $R(A,B)$

This is similar to the integer division operator $Z = X \div Y$, where given two integers X and Y, their quotient Z is the the largest integer where $Y \times Z \leq X$