CS 143 HW 1

1) $S - R = [(2,5,4)]$

$R - S = [(4,5,6), (1,2,6)]$

$(R-S) \cup (S-R) = [(4,5,6), (1,2,6), (2,5,4)]$

2) $R \bowtie_{R.A < S.C \wedge R.B < S.D} S = [(1,2,2,4,6),$
$(1,2,8,6,8),$
$(1,2,7,5,9),$
$(3,4,2,4,6),$
$(3,4,8,6,8),$
$(3,4,7,5,9),$
$(5,6,8,6,8)]$

3a) $\pi_{customer\text{-}name}(\sigma_{branch\text{-}name = 'Region12'} Account)$

b) $\pi_{customer\text{-}name}\left(Account \bowtie_{Account.customer\text{-}name = R.customer\text{-}name \wedge Account.branch\text{-}name \,!= R.branch\text{-}name} \left[\rho_R\left(Customer \bowtie_{Customer.city = Branch.city} Branch\right)\right]\right)$

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

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

f) $\Pi_{customer\text{-}name} Customer - \Pi_{customer\text{-}name} \Big(\rho_{A_1}(Account) \bowtie_{A_1.customer\text{-}name = A_2.customer\text{-}name \wedge A_1.branch\text{-}name \, != \, A_2.branch\text{-}name} \rho_{A_2}(Account) \Big)$

$- \left(\Pi_{customer\text{-}name} Customer - \Pi_{customer\text{-}name} Account \right.$

e) $\Pi_{(branch\text{-}name,\ customer\text{-}name)} Account \div$

$\Pi_{branch\text{-}name} \left(\sigma_{branch\text{-}name = \text{"los angeles"}} Branch \right)$

4) $\Pi_{SID}\ \text{Student} - \Pi_{S_1.SID}\left[\sigma_{S_1.sid \,!= S_2.sid \,\wedge\, S_1.GPA > S_2.GPA}\ \rho_{S_1}(\text{Student}) \times \rho_{S_2}(\text{Student})\right]$

5) $\Pi_{customer\text{-}name}\ \text{Customer} - \Pi_{customer\text{-}name}\Big[\Pi_{branch\text{-}name,\, customer\text{-}name}\left(\Pi_{customer\text{-}name}\ \text{Customer} \times \sigma_{city = \text{"los angeles"}}\ \text{Branch}\right) - \Pi_{branch\text{-}name,\, customer\text{-}name}\ \text{Account}\Big]$

6) Division in Relational Algebra Does the opposite of cross product where in $R \div S$, R/S is a subset of R. This is similar to integer division that does the opposite of multiplication where in $R \div S$ R is divided into S sets and R/S is a subset of R.