CS143: Homework #1 Solution (Relational Algebra)

1. Solution:

   Relation $(R - S)$:

A	B	C
7	5	3
1	4	3
6	7	9

   Relation $(S - R)$:

A	B	C
1	4	4
8	3	2

   Relation $(R - S) \cup (S - R)$:

A	B	C
7	5	3
1	4	3
6	7	9
1	4	4
8	3	2

2. Solution: Relation $X = \sigma_{R.L>S.M \wedge R.M<S.P}(R \times S)$ is:

R.L	R.M	S.M	S.N	S.P
4	3	1	6	4
4	3	3	4	7
6	5	3	4	7
8	7	6	1	8

3. Solution:

   (a)

$$\Pi_{\text{Student-name}} - \Pi_{\text{Student-name}}(\sigma_C(\text{Enrollment}))$$

   where $C =$ (Course-name = "Database Management Systems")

(b)

$$\Pi_{\text{Student-name}}(\sigma_C(\text{Student} \bowtie \text{Enrollment}) \times \text{Course})$$

where $C = (\text{Student.Department} \neq \text{Course.Department} \wedge \text{Enrollment.Course-name} = \text{Course.Course-name})$

(c)

$$\Pi_{\text{Course-name}}(\text{Course}) - \Pi_{\text{Course-name}}(\text{Enrollment})$$

(d)

$$\Pi_{\text{Department}}(\text{Student} \bowtie \Pi_{\text{Student-name}}(\sigma_{\text{Department=CS}}(\text{Enrollment} \bowtie \text{Course})))$$

(e)

$$\Pi_{\text{Department}}(\text{Student} \bowtie (\Pi_{\text{Student-name}}(\text{Student}) - \Pi_{\text{E1.Student-name}}(\sigma_C(D))))$$

where $D = (\rho_{\text{E1}}(\text{Enrollment}) \times \rho_{\text{E2}}(\text{Enrollment}))$
and
$C = (\text{E1.Student-name} = \text{E2.Student-name} \wedge \text{E1.Course-name} \neq \text{E2.Course-name})$

4.

$$\Pi_{\text{Company-name}}(\text{Company}) - \Pi_{\text{C1.Company-name}}(\sigma_{\text{C1.valuation>C2.valuation}}(\rho_{C1}(\text{Company}) \times \rho_{C2}(\text{Company})))$$