Kieren Ng
Database Systems
Homework 1

2.4.1
a) R1 := $\sigma_{speed \geq 3.00}$(PC)
R2 := π_{model}(R1)

b) R1 := $\sigma_{hd \geq 100}$(Laptop)
R2 := (Product) ⋈ (R1)
R3 := π_{maker}(R2)

c) R1 := $\sigma_{maker = \text{'B'}}$(Product)
R2 := $\pi_{model,\ price}$(PC) ∪ $\pi_{model,\ price}$(Laptop) ∪ $\pi_{model,\ price}$(Printer)
R3 := (R1) ⋈ (R2)
R4 := $\pi_{model,\ price}$(R3)

d) R1 := $\sigma_{color = true\ \&\ type = \text{'laser'}}$(Printer)
R2 := π_{model}(R1)

e) R1 := $\sigma_{type = \text{'laptop'}}$(Product)
R2 := $\sigma_{type = \text{'pc'}}$(Product)
R3 := π_{maker}(R1) – π_{maker}(R2)

2.4.5
The difference between the natural join and the theta join is that the theta joined table will be the cross product between R and S, but with the condition applied that the table will only have tuples such that R.A and S.A are equal.

The natural join, however, will try to combine the similar parts between the two tables into one attribute (like R.A would combine with S.A), rather than concatenating them an applying a condition.

2.4.7
a) R ∪ S

The minimum number of tuples from this union would be either n or m tuples, this would be the case where R has the exact same tuples as S.

The maximum number of tuples from this union would be n+m tuples, this would be the case where R has no common tuples with S, so the union would add the two together.

b) R ⋈ S

The minimum number of tuples from this natural join would again be 0 tuples, in the case that R has no common tuples with S.

The maximum number of tuples from this natural join would be n*m tuples, in the case that R has no common attributes with S.

c) $\sigma_C(R) * S$, for some condition C

The minimum number of tuples in this case would be 0 tuples, in the case where the condition C doesn't find any tuples in R, then the product would be 0 * m tuples.

The maximum number of tuples in this case would be n * m tuples, in the case where the condition C selects every tuple in R, then the product would be n * m tuples.

d) $\pi_L(R) – S$, for some list of attributes L

The minimum number of tuples in this case would be when R has the same tuples as S.

The maximum number of tuples in this case would be n tuples, in the case where R has no tuples in common with S.