Exercises: Rewriting

Exercise 1
Rewrite the query \(q(x)\) with respect to \(T\) to obtain the certain answers of \(q(x)\) over \(\langle T, A \rangle\).

\[T = \{ B \subseteq A, A \subseteq \exists S, P \subseteq R^{-}\}\]
\[A = \{ R(a, b), S(c, d), P(c, a), B(b) \}\]

\[q(x) = \exists y R(a, x) \land S(x, y)\]

Exercise 2
Rewrite the query \(q(x)\) with respect to \(\Sigma\) to obtain the certain answers of \(q(x)\) over \(\langle \Sigma, D \rangle\).

\[\Sigma = \{ B(X) \rightarrow R(X, Y) \land P(Y, Z),\]
\[P(X, Y) \rightarrow S(X, Y) \land A(Y),\]
\[S(X, Y) \rightarrow R(X, Z) \land S(Z, Y) \}\]
\[D = \{ A(a), B(b), S(c, a) \}\]

\[q(x) = \exists y z R(x, y) \land S(y, z) \land A(z)\]

Exercise 3
1. Rewrite the query \(q(x)\) with respect to \(\Sigma\) to obtain the certain answers of \(q(x)\) over \(\langle \Sigma, D \rangle\).

\[\Sigma = \{ A(X) \rightarrow R(X, Y) \land B(Y),\]
\[R(X, Y) \rightarrow P(Y, X),\]
\[B(X) \rightarrow R(X, Y) \land P(Y, Z),\]
\[S(X, Y) \rightarrow R(X, Z) \land P(Z, Y),\]
\[C(X) \rightarrow R(Y, X) \land P(X, Y) \}\]
\[D = \{ A(a), B(b), S(c, d), C(d) \}\]

\[q(x) = \exists y R(x, y) \land P(y, x)\]

2. Rewrite the query \(q(x)\) with respect to \(\Sigma' = \Sigma \setminus \{ R(X, Y) \rightarrow P(Y, X) \}\) to obtain the certain answers of \(q(x)\) over \(\langle \Sigma', D \rangle\).