Exercises: Rewriting

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

$$T = \{ B \sqsubseteq A, A \sqsubseteq \exists S, P \sqsubseteq R \}$$
$$A = \{ R(a, b), S(c, d), P(c, a), B(b) \}$$

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

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 $\langle \Sigma', D \rangle$.