Now we are able to explain (1) and (2). Regardless of how we interpret the constants, predicates, and function symbols occurring in P and the query, once the predicate logic interpretation of P is true, $\exists X_1 \ldots \exists X_k(B_1 \wedge \ldots \wedge B_n)$ must be true, too. That is, there are values for the variables $X_1, \ldots, X_k$ such that all atomic formulas B_i become true.

For example, suppose P is the program

$$p(a)$$

$$p(X) \rightarrow q(X)$$

Consider the query

$$q(X) \rightarrow$$

Clearly, $q(a)$ follows from $pl(P)$. Therefore, $\exists X q(X)$ follows from $pl(P)$, thus $pl(P) \cup \{\neg \exists X q(X)\}$ is unsatisfiable, and we give a positive answer. But if we consider the query

$$q(b) \rightarrow$$

then we must give a negative answer because $q(b)$ does not follow from $pl(P)$.

5.4.2 Least Herbrand Model Semantics

The other kind of semantics for logic programs, least Herbrand model semantics, requires more technical treatment, and is described in standard logic textbooks (see suggested reading).

5.4.3 Ground and Parameterized Witnesses

So far we have focused on yes/no answers to queries. However, such answers are not necessarily optimal. Suppose that we have the fact