

# Logic for AI — Master 1 Informatique

## Class Assignment #4: Predicate Logic

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### 1 Herbrand Base

Write the Herbrand base for the following language:

$$\{a, b, f(\cdot), g(\cdot, \cdot), P(\cdot, \cdot, \cdot)\}.$$

### 2 Herbrand Entailment

Which of the following entailments hold, using Herbrand semantics?

1.  $Q(a) \models \forall x(P(x) \Rightarrow Q(x))$ ,
2.  $P(a) \models \neg Q(b) \wedge \exists x(P(x) \wedge Q(x))$ .

### 3 Semantic Trees

Check the Herbrand satisfiability of the following sentence by applying Herbrand's Theorem:

$$\neg(\forall xP(x, a, g(x, b)) \Rightarrow \exists y\exists zP(f(y), z, g(f(a), b))).$$