Exercise 4.1
Consider the following program $P$:

\[
\begin{align*}
\text{double}(0,0). \\
\text{double}(s(X),s(s(Y))) & :- \text{double}(X,Y).
\end{align*}
\]

(a) Give the Herbrand universe $HU_F$ and the Herbrand base $HB_{HU,F}$ determined by $P$.

(b) Give two models of $P$.

(c) Consider the following interpretations $I_1$ and $I_2$. For each case specify whether the given interpretation satisfies $P$ or not. Justify your answer.

- $I_1 : D_{I_1} = \mathbb{N}, 0_{I_1} = 1, s(t)_{I_1} = 2 \times t_{I_1}, double_{I_1} = \{(a, a^2) \mid a \geq 1\}$
- $I_2 : D_{I_2} = \mathbb{N}, 0_{I_2} = 0, s(t)_{I_2} = (2 \times t_{I_2}) + 1, double_{I_2} = \{(0, 0)\} \cup \{(a, a^2 - a + 1) \mid a \geq 1\}$