Translate the following English sentences into the language of Predicate Logic (PPL) using the following properties (predicates) and constants. **You must write the proper English restatement just as in the class notes before giving the symbolization.**

- $P_x = x$ is a person
- $O_x = x$ is old
- $N_x = x$ needs help
- $R_x = x$ is retired
- $G_x = x$ is a gardener
- $S_x = x$ is sick
- $F_x = x$ is a fisherman
- $t = Theresa$

1. “Everyone needs help.”
   $$\forall x(P_x \supset N_x)$$

2. “Theresa is a retired gardener.”
   $$G_t \& R_t$$
   (Actually, this sentence is ambiguous between saying (1) she is both retired and a gardener, and (2) she used to be a gardener but has since retired (implying that any gardening she does now is not as a professional.) this second sentence we cannot translate so you should just do the first version.

3. “Any retired person who isn’t a fisherman is a gardener.”
   $$\forall x((P_x \& (R_x \& \neg F_x)) \supset G_x)$$

4. “Every retiree is old, and Theresa is a retiree.”
   $$\forall x(R_x \supset O_x) \& R_t$$
   or
   $$\forall x((P_x \& R_x) \supset O_x) \& R_t$$

5. “No one is sick.”
   $$\neg \exists x(P_x \& S_x)$$

6. “Anyone who is old or retired needs help.”
   $$\forall x((P_x \& (O_x \lor R_x)) \supset N_x)$$

7. “Not everyone who needs help is old.”
   $$\neg \forall x((P_x \& N_x) \supset O_x)$$

8. “Either all gardeners are not retired or Theresa is a gardener.”
   $$\forall x(G_x \supset \neg R_x) \lor G_t$$
   or
   $$\neg \exists x(G_x \& R_x) \lor G_t$$

9. “Every old person doesn’t get sick.”
   $$\forall x((P_x \& O_x) \supset \neg S_x)$$
   This is a sentence that people say when they really mean “Not every old person gets sick,” which is $$\neg \forall x((P_x \& O_x) \supset S_x)$$.

10. “All sick people are old, retired, and don’t need help.”
    $$\forall x((P_x \& S_x) \supset (O_x \& (R_x \& \neg H_x)))$$