Exercise 1
Give an interpretation that satisfies $\forall x. \forall y. (p(x) \rightarrow p(y))$.

Exercise 2
Prove the following first order statements in Isabelle (Note that $P x$ in Isabelle is the same as the usual $P(x)$):

1. $(\forall x. P x \rightarrow Q) \rightarrow (\exists x. P x \rightarrow Q)$
2. $\forall x. \neg P x$, assuming that $\neg \exists x. P x$ is true
3. $\exists x. \neg P x$, assuming that $\neg \forall x. P x$ is true

Exercise 3
Give tree representation proofs for the statements in the above exercise, annotating your steps using the Isabelle names of rules (e.g. allI, exI, etc).