Let . We want to prove that . First of all, if and are in and , then that means there exist non-deterministic Turing machines that decide ,  , , and in polynomial time. We name these machines , , , and , respectively. Such machines exist because of the aforementioned definition of , and that the definition of a language being is if its complement is in (i.e. if its complement can be decided by such a machine). This gives rise to our following algorithm:

To show :

If , i.e. , we output yes if and only if accepts and   accepts. Then if , i.e. , we output yes if and only if accepts and   accepts.

Similarly, to show that :

If , we output yet if and only if   accepts and accepts. Then if , we output yes if and only if accepts and    accepts.