We say that two languages, $L_1$ and $L_2$ are polynomial time equivalent if there is a Karp reduction from $L_1$ to $L_2$ and there is a Karp reduction from $L_2$ to $L_1$. In the last class we have proven that if $3SAT \notin DTIME(f(n))$ for any $f = o(2^n)$ (that is, the quickest machine for $3SAT$ cannot run quicker than $\Omega(2^n)$), then there is a language $L \in NP$, which is neither in polynomial time nor in $NP – hard$ (such $L$ is called $NP – intermediate$).

In this homework show that under the same assumption we can find two languages, $L_1, L_2 \in NP$ that are not in polynomial time nor $NP – hard$, and that $L_1$ and $L_2$ are not polynomial time equivalent with each other.

Remark: in the literature a much stronger statement is shown: if $P \neq NP$, then there are infinitely many polynomially non-equivalent languages in $NP$. This statement is stronger than the homework for two reasons: 1. The premise is much weaker 2. The conclusion is stronger.