

Polynomial transformation

- The polynomial transformation (reduction) of a problem Π_2 into problem Π_1 (denoted as $\Pi_2 \propto \Pi_1$) is a function $f : D_{\Pi_2} \rightarrow D_{\Pi_1}$ which satisfies the following conditions:
 - For each instance $I_2 \in D_{\Pi_2}$, the answer is “yes” if and only if the answer for $f(I_2)$ is also “yes”
 - The time to run the function f is bounded above by a polynomial of size of the input.
- Polynomial transformation is a method for solving one problem using another. If we can transform in polynomial time the input to a problem A into the input to problem B (which we know how to solve in polynomial time) then we can also solve the problem A in polynomial time.
- A polynomial-time reduction proves that the first problem is no more difficult than the second one, because whenever an efficient algorithm exists for the second problem, one exists for the first problem as well. By contraposition, if no efficient algorithm exists for the first problem, none exists for the second either.