Prove that InArray $\leq_k$ LongSimplePath. Use proof by construction to prove this. So firstly, we need to adopt a function *m* that maps the input of InArray to the input of LongSimplePath, which is from <*A, i*> to <*G,a,b,k*>. Also, notice that the problem InArray $\in$ **P**. So for LongSimplePath, we will prepare two instances for it, $i_t$ being the true instance, and $i_f$ being the false instance. And for $i_t$, it could be G = <V, E> where V = {a, b} and E = {<a, b>}, the vertices a, b, and k = 1. For $i_f$, it could be G = <V, E> where V = {a, b} and E = {<a, b>}, the vertices a, b, and k = 2. Now, by construction, we propose the flowing mapping function *m*, given an instance <*A, i*>, introduce a graph G = <V, E> and k. Since InArray $\in$ **P**, it can find whether *i* is in A in polynomial time. If *i* in A then k = 1, else k = 2. Finally, call LongSimplePath(G, a, b, k), and return whatever it returns.

For the only if direction, suppose for InArray, *i* is in A, then it's true and k = 1, which for LongSimplePath, it would map to $i_t$. For the if direction, suppose for InArray, *i* is not in A, and for the purpose of contradiction, LongSimplePath would output true. And this means it has k = 1, and this is only the case when *i* is in A, which is a contradiction.