1. Prove using the PMI: $\forall n \in \mathbb{N} \sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$.
2. Let $P(n) : \sum_{k=1}^{n}(2k) = (n+2)(n-1)$. Find the truth values of the following propositions:
   (a) $\forall k \in \mathbb{N}\ P(k) \to P(k+1)$;
   (b) $\overline{\forall k \in \mathbb{N}\ P(k)}$.