1. **Claim:** For all natural numbers n, if n is even then $n^2 + 2011$ is odd.

   Proof: *by Induction*
   Let
   $$P(n) = n^2 + 2011 \forall n \in N$$

   Base Case:

   $$P(0) = 0^2 + 2011 = 2011$$

   which is odd. So the base case is true.

   Inductive Step:

   Assume $P(n)$ is true. Taking $P(n+2)$

   $$P(n+2) = (n+2)^2 + 2011$$
   $$P(n+2) = n^2 + 4n + 2015$$

   Take $K(q) = q^2 + 4q + 2015$. There is only one possibility

   (a) q is even. If q is even, q^2 is also even. Moreover $4q$ becomes even. So we have
   $$K(q) = Even + Even + Odd$$
   $$K(q) = Even + Odd$$
   $$K(q) = Odd$$

   So, $P(n+2) = n^2 + 4n + 2015$ is odd. So, $P(n) \to P(n+2)$ is true. The claim is correct.