Exercises of Proof by Recurrence

I. Let (P_n) be the formula $\boxed{1^3 + 2^3 + 3^3 + ... + n^3 = \left(\frac{n(n+1)}{2}\right)^2}$

1. Intitialization : check that (P_1) is TRUE :

2. Heredity : prove that for any given $k \geq 1$ the implication $\boxed{(P_k) \Rightarrow (P_{k+1})}$ is TRUE

3. Conclusion :

II. Let (P_n) be the formula $\boxed{a + aq + aq^2 + ... + aq^n = a\frac{1-q^{n+1}}{1-q}}$

1. Intitialization : check that (P_0) is TRUE :

2. Heredity : prove that for any given $k \geq 0$ the implication $\boxed{(P_k) \Rightarrow (P_{k+1})}$ is TRUE

3. Conclusion :

III. Let (P_n) be the formula $2^n = n^2$

1. Intitialization : check that (P_2) is TRUE :

2. Heredity : prove that for any given $k \geq 3$ the implication $\boxed{(P_k) \Rightarrow (P_{k+1})}$ is Wrong

3. Conclusion :

IV. Let (P_n) be the formula $n = n + 1$

1. Intitialization : check that (P_0) is Wrong :

2. Heredity : prove that for any given $k \geq 3$ the implication $\boxed{(P_k) \Rightarrow (P_{k+1})}$ is TRUE

3. Conclusion :