Proof by mathematical induction-deduction based on my definition

August 20, 2022 Yuji Masuda
y_masuda0208@yahoo.co.jp

Abstract

In this chapter, I will explain a new method of proof, which is both mathematical induction and deduction at the same time, based on my definition series, with concrete examples.

General comments

The examples used in this study are as follows.

$$(-1)^{\left(\frac{P_n^2-1}{24}\right)}=(-1)^{\frac{\left(P_n-(-1)^{\left(\frac{P_n-1}{2}\right)}\right)}{4}}\quad(\because n\geq 2)\qquad\cdots\cdots①$$

Proof

$$(-1)^{\left(\frac{P_\infty^2-1}{24}\right)}=(-1)^{\left(\frac{5^2-1}{24}\right)}=-1$$

$$(-1)^{\frac{\left(P_\infty-(-1)^{\left(\frac{P_\infty-1}{2}\right)}\right)}{4}}=(-1)^{\frac{\left(5-(-1)^{\left(\frac{5-1}{2}\right)}\right)}{4}}=(-1)^{\frac{\left(5-(-1)^2\right)}{4}}=-1$$

$$\therefore(-1)^{\left(\frac{P_\infty^2-1}{24}\right)}=(-1)^{\frac{\left(P_\infty-(-1)^{\left(\frac{P_\infty-1}{2}\right)}\right)}{4}}\qquad\cdots(\mathrm{B})$$

$$(-1)^{\left(\frac{P_{\infty+1}^2-1}{24}\right)}=(-1)^{\left(\frac{P_4^2-1}{24}\right)}=(-1)^{\left(\frac{7^2-1}{24}\right)}=(-1)^2=1$$

$$(-1)^{\frac{\left(P_{\infty+1}-(-1)^{\left(\frac{P_{\infty+1}-1}{2}\right)}\right)}{4}}=(-1)^{\frac{\left(P_4-(-1)^{\left(\frac{P_4-1}{2}\right)}\right)}{4}}=(-1)^{\frac{\left(7-(-1)^{\left(\frac{7-1}{2}\right)}\right)}{4}}=(-1)^{\frac{\left(7-(-1)^3\right)}{4}}=(-1)^2$$

$$\therefore(-1)^{\left(\frac{P_{\infty+1}^2-1}{24}\right)}=(-1)^{\frac{\left(P_{\infty+1}-(-1)^{\left(\frac{P_{\infty+1}-1}{2}\right)}\right)}{4}}\qquad\cdots(\mathrm{C})$$

$$(-1)^{\left(\frac{P_2^2-1}{24}\right)}=(-1)^{\left(\frac{3^2-1}{24}\right)}==(-1)^{\left(\frac{1}{3}\right)}-1$$

$$(-1)^{\frac{\left(P_2-(-1)^{\left(\frac{P_2-1}{2}\right)}\right)}{4}}=(-1)^{\frac{\left(3-(-1)^{\left(\frac{3-1}{2}\right)}\right)}{4}}=(-1)^{\frac{(3-(-1))}{4}}=-1$$

$$\therefore(-1)^{\left(\frac{P_2^2-1}{24}\right)}=(-1)^{\frac{\left(P_2-(-1)^{\left(\frac{P_2-1}{2}\right)}\right)}{4}}\qquad\cdots(\mathrm{A})$$

The above shows that it holds for n = ∞ and also holds for n = $\infty+1$, which means that it also holds for n = 2. Therefore, the equality (1) is proved to be correct.