# *Proofs using my definition series 2*

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**Abstract**
The purpose of this short paper is to provide a proof based on my definition series to determine the correctness of my previous papers No.21.

**General comments**
The proofs of No. 21 were established by my definition series.

$$\boxed{No.21}\ \prod_{n=1}^{\infty}\frac{e}{\left(1+\frac{1}{P_n}\right)^{P_n}}=\sqrt{\ln(P_n)}$$

【Proof】

$$P_1=2,\quad P_2=3=-2,\quad P_3=5=0,\quad P_4=7=2,\quad P_5=11=1,\quad P_6=13=-2,\quad P_7=17=-3,\quad P_8=19=-1,\cdots$$

$$\prod_{n=1}^{\infty}\frac{e}{\left(1+\frac{1}{P_n}\right)^{P_n}}=\left[\left(\frac{e}{\left(1+\frac{1}{P_1}\right)^{P_1}}\right)\left(\frac{e}{\left(1+\frac{1}{P_2}\right)^{P_2}}\right)\left(\frac{e}{\left(1+\frac{1}{P_3}\right)^{P_3}}\right)\left(\frac{e}{\left(1+\frac{1}{P_4}\right)^{P_4}}\right)\left(\frac{e}{\left(1+\frac{1}{P_5}\right)^{P_5}}\right)\right]^{\left(\frac{\infty-3}{5}\right)}\times\left(\frac{e}{\left(1+\frac{1}{P_1}\right)^{P_1}}\right)\left(\frac{e}{\left(1+\frac{1}{P_2}\right)^{P_2}}\right)\left(\frac{e}{\left(1+\frac{1}{P_3}\right)^{P_3}}\right)$$

$$=1\times\left(\frac{e}{\left(1+\frac{1}{P_1}\right)^{P_1}}\right)\left(\frac{e}{\left(1+\frac{1}{P_2}\right)^{P_2}}\right)\left(\frac{e}{\left(1+\frac{1}{P_3}\right)^{P_3}}\right)=\frac{e^3}{\left(\left(1+\frac{1}{P_1}\right)^{P_1}\right)\left(\left(1+\frac{1}{P_2}\right)^{P_2}\right)\left(\left(1+\frac{1}{P_3}\right)^{P_3}\right)}$$

$$=\frac{3^3}{\left(\left(1+\frac{1}{2}\right)^{2}\right)\left(\left(1+\frac{1}{3}\right)^{3}\right)\left(\left(1+\frac{1}{5}\right)^{5}\right)}=\frac{3^3}{\left(\left(1+\frac{1}{2}\right)^{2}\right)\left(\left(1+\frac{1}{3}\right)^{3}\right)\left(\left(1+\frac{1}{0}\right)^{0}\right)}$$

$$=\frac{27}{\frac{9}{4}\times\frac{64}{27}\times\left(\frac{1\cdot 0+1}{0}\right)^{0}}=\frac{2}{\frac{16}{3}\times\left(\frac{1}{0}\right)^{0}}=\frac{2}{\frac{16}{3}\times\frac{1}{0}}=\frac{2}{\frac{16}{3}\times(\pm\infty)}=\frac{2}{\frac{16}{3}\times 3}=\frac{2}{16}=\frac{2}{1}=2(=i)$$

$$\sqrt{\ln(P_\infty)}=\sqrt{\ln(P_3)}=\sqrt{\ln(0)}=\sqrt{\ln\left(\frac{1}{\pm\infty}\right)}=\sqrt{\ln\left(\frac{1}{e}\right)}=\sqrt{\ln e^{(-1)}}=\sqrt{-1}(=i)=\sqrt{4}=2$$