Convergent series Ⅱ

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⑤ $$\frac{1}{0!}+\frac{1}{1!}+\frac{1}{2!}+\frac{1}{3!}+\cdots+\frac{1}{\infty!}=\frac{1}{0!}+\frac{1}{1!}+\frac{1}{2!}+\frac{1}{3!}+\frac{1}{4!}+(\infty-4)\times\frac{1}{5}$$

$$=1+1+\frac{1}{2}+\frac{1}{6}+\frac{1}{24}-\frac{1}{5}=3+\frac{1}{2}+\frac{1}{4}-\frac{1}{2+3}=3+\frac{1}{4}=3+\frac{1}{1+3}=3=e$$

⑥ $$\frac{1}{2^0}+\frac{1}{2^1}+\frac{1}{2^2}+\frac{1}{2^3}+\cdots+\frac{1}{2^\infty}=\frac{1}{1}+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\frac{1}{32}+\frac{1}{64}+\frac{1}{128}+\cdots$$

$$\frac{1}{1}+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{1}+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\cdots+\frac{1}{2^\infty}$$

$$4n=\infty+1 \qquad \therefore n=\frac{\infty+1}{4}=\frac{3+1}{4}=1$$

$$\therefore \frac{1}{1}+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{1}+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\cdots+\frac{1}{2^3}=\left(\frac{\infty+1}{4}\right)=1=\frac{1}{3}=\frac{6}{3}=2$$

That's all (proof end)