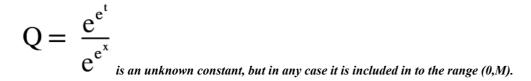
<u>Proof of the Transcendence of</u> **e**^e

$$I(t) = \int_0^t e^{e^{t-x}} f(x) dx$$

$$\begin{cases} x > t & \rightarrow & 0 < \frac{e^{e^{t}}}{e^{e^{x}}} < 1 \\ t \setminus \{\infty\} > x & \rightarrow & 1 < \frac{e^{e^{t}}}{e^{e^{x}}} < M \end{cases}$$

$$\int e^{et-ex} = Q \in (0,M)_{id est} \frac{e^{e^{t}}}{e^{e^{t}}}$$

is a not well defined number of which we do not know the numeric set



Then $m_{is the degree of} f(x)_{. So, we integrate} I(t)_{by parts} m_{times:}$

$$Q\left\{ \left[x f(x) \right]_{0}^{t} - \int_{0}^{t} f^{(j)}(x) dx \right\} \dots =$$

$$= Q \left[x f^{(j)}(x) \right]_{0}^{t} = Q t \sum_{j=0}^{m} f^{(j)}(t)$$

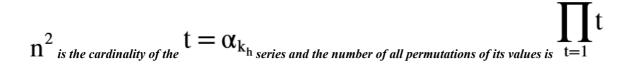
where ${\rm m}$ is the degree of the integrand and $f^{({\rm j})}$ is the jth derivative of f ,

its input is an arbitrary set of distinct conjugate complex numbers taken over the line joining [0,t] The use of complex numbers ensures that this non-constant polynomial has roots (fundamental theorem of Algebra), and the complex conjugation give us real roots if **M** is an odd degree (complex conjugate root theorem).

$$\mathbf{t} = \left[\alpha_{1_1}, \dots, \alpha_{1_n}, \dots, \alpha_{2_1}, \dots, \alpha_{2_n}, \dots, \alpha_{n_1}, \dots, \alpha_{n_n}\right]_{is \ a \ complete \ set \ of \ conjugates.}$$

 $oldsymbol{\alpha}_{k_h}$ are distinct algebraic numbers linearly independent over the rationals.

the conjugate plane 1 intersects the conjugate plane 1 then the plane 2 intersects the plane 1 and so on... the intersections of the points generate overlaps and misalignaments between 'h' and 'k' planes



$$n \in \mathbb{N} \setminus \{\infty\}$$
 $1 \le i, y, k, h \le n$

 λ is the positive integer leading coefficient in the minimal polynomial defining t

$$\begin{split} & \int_{i_{y}}^{nnp} \left\{ \prod_{\substack{k=[1,n]\\h=[1,n]}}^{n} \left(t - \alpha_{k_{h}}\right) \right\}^{p} \\ & \quad f_{i_{y}}(t) = \frac{\left(t - \alpha_{i_{y}}\right)}{\left(t - \alpha_{i_{y}}\right)}_{, \text{ where }} p \setminus \{\infty\}_{is \text{ a very large Prime}} \end{split}$$

 β_{k_h} are non-zero integers. Then by our hypothesis of e^e Algebraic number, have

$$\beta_{1_1}e^{e^{\alpha_{1_1}}} + \dots + \beta_{2_1}e^{e^{\alpha_{2_1}}} + \dots + \beta_{2_n}e^{e^{\alpha_{2_n}}} + \dots + \beta_{n_1}e^{e^{\alpha_{n_1}}} + \dots + \beta_{n_n}e^{e^{\alpha_{n_n}}} = 0$$

$$J_{i_{y}} = Q \sum_{j=0}^{mp-1} \sum_{\substack{k=\\h=[1,n]}}^{n} \alpha_{k_{h}} \beta_{k_{h}} f^{(j)}(\alpha_{k_{h}})$$

then we use

where f_{i} is a symmetric polynomial that derivatived by substitution from zero to nnp-2 times returns value = zero, but if derivatived by substitution nnp-1 times returns an integer that is divisible by $(p-1)!_{but not by} p!$

$$\mathbf{J}_{\mathbf{n}_{\mathbf{n}}} = \mathbf{n}^2 \mathbf{J}_{\mathbf{i}_{\mathbf{y}}}$$

then, we use the lemma on transcendence given by the Liouville theorem :

 $\left|a - \frac{b}{c}\right| > \frac{K}{c^n}$, where, by our hypothesis, a is an irrational and algebraic number, and b and c are integers, and K is a Lipschitz constant sufficiently large

$$\frac{b}{c} = (p-1)! = \frac{C(p-1)! = b}{C = c}$$

where C is an integer near to $\rightarrow \infty$

we use the properties of the Lipschitz inequality:

$$K|e^{e} - (p-1)!| > |Q - f_{i_{y}}|$$

$$|e^{e} - (p-1)!| > \frac{1}{K}|Q - f_{i_{y}}| > \frac{K}{C^{n}}$$