

$$e^{z_1+z_2} = e^{z_1} \cdot e^{z_2} \quad (2) \quad , \quad (e^z)^t = e^{zt} \quad (1) \quad ; \quad e^{x+iy} = e^x (\cos y + i \sin y) \quad \text{and} \quad \underline{\underline{\text{...}}} \underline{\underline{\text{...}}}$$

$$\left. \begin{aligned} e^{x+iy} &= e^x \cdot e^{iy} \\ &\rightarrow \cos y + i \sin y \quad (\text{def}) \\ e^{i\pi} &= i \Rightarrow e^{\pi i} = -1 \Rightarrow e^{2\pi i} = 1 \end{aligned} \right\}, \forall z, e^z \neq 0 \quad (3)$$

$$z = \ln w \quad : \quad g(z) = c \cdot e^z$$

$$f'(2) = \frac{g'(2)e^3 - g(2)(e^2)}{(e^2)^2} = \frac{g(2)e^2 - g(2)e^2}{e^4} = 0 \iff f(2) = \frac{g(2)}{e^2} = \frac{15-20}{e^2} = \frac{-5}{e^2}$$

$$g(x) = C \cdot e^x \quad \text{und} \quad f(x) = C \cdot x$$

$$\text{Thus } \operatorname{Im}(z) = 0 \text{ implies } |e^z| = e^{x_0} \text{ so } \operatorname{Re}(z) = x_0 \text{ at } z \in \mathbb{R} \text{ implies } |e^z| = e^{\operatorname{Re}(z)}$$

לפניהם - $\{z \in C : |z| > c^k\}$ - סיבוב של $Re(z) > c^k$ מינימלי. מכאן ש- c^k מינימלי.

$$\left\{ \text{SEC: } |z| < e^{\frac{\pi}{2}} \right\} \rightarrow \text{Re}(z) < x_0 \text{ when } z \in \Gamma$$

$\vdash \text{LSPIN} \vdash \text{PDL} \vdash \text{S5} \vdash (\text{WFF}[\Box]) \vdash \Box^2 \vdash \Box \vdash \text{PDL} \vdash \text{S5} \vdash \text{LSPIN}$

$$Re(z) = \log|w| = \ln|w| \iff e^{\operatorname{Re}(z)} = |w|$$

$$\cdot e^{iy} = \frac{w}{|w|} \quad \text{पर} \quad e^z = e^{x+iy} = e^x \cdot e^{iy} = |w| \cdot e^{iy} \quad \text{मान लिए} \quad . \quad y = \log|w| \quad \text{है}, \quad z = x+iy$$

$$\left(\begin{array}{c} e^{z+2\pi i} = e^z \\ e^{z+2\pi i} = e^z \end{array} \right) \quad y = \theta + 2k\pi \in \arg(w) \Leftrightarrow \log|y| + i\arg y = \log|w| + i\arg w$$

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Dimensional Se hant koy u nisun f(z) = g(z)

$$u \sin x e^{x^2} = 2$$

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U ples wch se right we ar $\phi(z) \rightarrow F(z)$ is r

$$\forall z \in \mathbb{C}, \quad g(z) = f(z) + 2\pi i \quad \Rightarrow \quad e^{2\pi i z} = f(z)$$

$$e^{g(z)} = e^{f(z)} = z \quad \text{על מנת ש } , \quad e^{\frac{f(z)-f(a)}{z-a}} = e^{\frac{f(z)}{z-a}} = e^{f(z)} = z \quad \text{נובע מ}$$

$$\Rightarrow \text{אנו מודים } n(z) = \frac{g(z)-f(z)}{2\pi i} \rightarrow g(z), f(z) \in \log|z| + i \cdot \arg(z) \quad \text{וnde } n(z) \text{ נסובב}$$

$$n(U) = \{n\} \quad \text{ולפ' } U \text{ נסובב}$$

$$\text{Q.E.D. } \forall z \in U, \quad g(z) = f(z) + 2\pi i n$$

$$(-\pi, \pi) \rightarrow \text{היקף הימני של } z \quad \text{Arg}(z) \in \text{היקף} \quad U = \mathbb{C} \setminus \{x \leq 0\} \quad \text{הוכחה}$$

$$\text{לפ' } z \in U \Rightarrow z \mapsto \log|z| + i \cdot \text{Arg}(z) \quad \text{psi} \quad \Rightarrow \text{אנו מודים } (z \in U \Rightarrow z \in \mathbb{R}^+)$$

$$\left. \begin{array}{l} \text{לפ' } z \in U \Rightarrow z \mapsto \log|z| + i \cdot \text{Arg}(z) \\ \text{לפ' } z \in U \Rightarrow z \mapsto \log|z| + i \cdot \text{Arg}(z) \end{array} \right\} \text{לפ' } z \in U \Rightarrow z \mapsto \log|z| + i \cdot \text{Arg}(z) \quad \text{לפ' } z \in U \Rightarrow z \mapsto \log|z| + i \cdot \text{Arg}(z)$$

$$[\log z] = \log|z| + i \cdot \text{Arg}(z) : \text{לפ' } z \in U \Rightarrow z \mapsto \log|z| + i \cdot \text{Arg}(z)$$

הוכחה:

$$f'(a) \rightarrow \text{הוכחה של } g(f(z)) = z \quad \text{לפ' } a \text{ נסובב} \quad f \text{ נסובב}$$

$$a \in \text{היכן } g(f(a)) = z \quad \text{לפ' } a \in \text{היכן } g'(f(a)) \neq 0 \quad \text{לפ'}$$

$$f'(a) = \frac{1}{g'(f(a))} : \text{לפ' } a \in \text{היכן } f \text{ נסובב}$$

הוכחה:

$$f'(a) \leftarrow \frac{f(z) - f(a)}{z - a} \rightarrow \frac{1}{g'(f(a))} \quad \text{לפ' } \frac{z - a}{f(z) - f(a)} \rightarrow g'(f(a)) \quad \text{לפ' } \frac{g(f(z)) - g(f(a))}{f(z) - f(a)} \stackrel{z=a}{=} g'(f(a))$$

$$f'(z) = \frac{1}{g'(f(z))} = \frac{1}{z}$$

$$\text{לפ' } z_1, z_2 \in U \Rightarrow \log(z_1 z_2) = \log(z_1) + \log(z_2)$$

$$+\log i = \log|i| + i \cdot \text{Arg } i = \frac{i\pi}{2} \quad \text{לפ' } z_1 = r_1 e^{i\theta_1}, z_2 = r_2 e^{i\theta_2} \quad \text{לפ' } \theta_1 = \frac{\pi}{2}$$

$$\log(-1+i) = \log 1 + i + i \cdot \text{Arg}(-1+i) = \frac{1}{2} \log 2 + i \cdot \frac{3\pi}{4}$$

$$\log(i \cdot (-1+i)) = \log(-1-i) = \frac{1}{2} \log 2 - i \cdot \frac{3\pi}{4}$$

$$U \text{ נסובב} \Rightarrow \text{לפ' } 0 < \text{arg}(z) < 2\pi \quad \text{לפ' } z \in U \Rightarrow z \in \mathbb{R}^+ \quad \text{לפ' } z \in U$$

$$\boxed{\log(-z) = \log|z| + i\pi} \quad \text{לפ' } z = -x \quad \text{לפ' } z \in U \Rightarrow z \in \mathbb{R}^+ \quad \log z = \log|z| + i \cdot \text{arg}(z)$$