TRANSFORMATICS 101*

Joseph Willrich Lutalo†
Nuchwezi Research
joewillrich@gmail.com, jwl@nuchwezi.com

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1 Foundations of a New Mathematics of Sequences

1.1 Result 1: The Empty Sequence

$$\Theta = \langle\rangle \implies |\Theta| = 0 \quad \wedge \quad \Theta \equiv \emptyset$$

1.2 Result 2: A Symbol Set

$$\psi_\beta^n = \langle \beta_{i\in[1,n]} \rangle : n \in \mathbb{N} : \mathbb{u}(\beta_i \in \psi_\beta) = 1 \quad \forall \beta_i \in \psi_\beta$$

1.3 Result 3: A Sequence

$$\Theta^n = \langle \theta_{i\in[1,n]} \rangle : \mathbb{N} \times \psi_\beta : n \geq 1$$

1.4 Result 4: Sequence Cardinality

$$\forall \Theta^n = \langle \theta_{i\in[1,n]} \rangle : \mathbb{N} \times \psi_\beta \quad \implies \quad \mathbb{u}(\Theta^n) = |\Theta^n| = n \in \mathbb{N}$$

1.5 Result 5: A Sequence Symbol Set

$$\psi(\Theta^n) = \langle \theta_{i\in[1,k]} \rangle : k, n \in \mathbb{N} \wedge k \geq 1 : \mathbb{u}(\theta_i \in \psi(\Theta^n)) = 1 \quad \forall \theta_i \in \Theta^n : k \leq n : \mathbb{u}(\psi(\Theta^n)) = k$$

1.6 Result 6: A Sequence Transformation

$$\Theta^n = \langle \theta_{i\in[1,n]} \rangle : \mathbb{N} \times \psi_\beta \to \Theta^* = \langle \theta^*_{i\in[1,k]} \rangle : \mathbb{N} \times \psi_* : \psi_\beta \neq \psi_* \vee \psi(\Theta^n) \neq \psi(\Theta^*) \vee \overset{>}{\psi}(\Theta^n) \neq \overset{>}{\psi}(\Theta^*)$$

1.7 Result 7: A Sequence Transformer

$$\Theta^n = \langle \theta_{i\in[1,n]} \rangle : \mathbb{N} \times \psi_\beta \xrightarrow{f(\Theta)=\Theta^*} \Theta^* = \langle \theta^*_{i\in[1,k]} \rangle : \mathbb{N} \times \psi_*; \quad \psi_\beta \neq \psi_* \vee \psi(\Theta^n) \neq \psi(\Theta^*) \vee \overset{>}{\psi}_\beta \neq \overset{>}{\psi}_*$$

1.8 Result 8: A Sequence Filter

$$\Theta^n = \langle \theta_{i\in[1,n]} \rangle : \mathbb{N} \times \psi_\beta \xrightarrow{f(\Theta,\psi_{\beta^*})=\Theta^*} \Theta^* = \langle \theta^*_{i\in[1,k]} \rangle : \mathbb{N} \times \psi_{\beta^*};$$
$$k \in \mathbb{N} : \psi_{\beta^*} \subseteq \psi_\beta \implies \mathbb{u}(\Theta^*) = k \geq \mathbb{u}(\psi_{\beta^*}) \leq \mathbb{u}(\Theta^n) \geq \mathbb{u}(\psi_\beta)$$

1.9 Result 9: A Sequence Generator

$$\Theta^n|\emptyset \xrightarrow{f(\psi_\beta,k))=\Theta^*} \Theta^k = \langle \beta^*_{i\in[1,k]} \rangle : \mathbb{N} \times \psi_\beta : k \in \mathbb{N} : \forall \beta_i \in \Theta^k \implies \beta_i \in \psi_\beta = \Psi^\infty \cup \Theta^n \quad \wedge \quad k \geq 1$$

1.10 Result 10: A Sequence Sampler

$$\Theta^n \xrightarrow{f(\Theta^n,k))=\Theta^k} \Theta^k = \langle \theta_{i\in[1,k]} \rangle : \mathbb{N} \times \psi(\Theta^n) : k, n \in \mathbb{N} \wedge k \geq 1$$

*This revision partly overrides original 8^{th} October foundation paper in Results #6, #7, and #8.

†Principal Investigator at Nuchwezi Research, GARUGA, Uganda.
ORCID: https://orcid.org/0000-0002-0002-4657