

宇田雄一「古典物理学」

F^+_1 の定義: $\forall x \in N_{01}(N_{01})$;

$$F^+_1(x) = \{ f | f \in F_1 \text{ and } \forall t \in \mathbb{R}(\{4\}); \forall \xi \in N_{01}; [1] \Rightarrow [2] \}$$

$$[1] \quad \xi(4) = t(4) \text{ and } \xi(3) = f(t, \square)$$

$$[2] \quad [\partial_4 x(\xi)](4) + \sum_{i=1}^3 \partial_4 f(t, i) \cdot [\partial_i x(\xi)](4) > 0$$

F^-_1 の定義: $\forall x \in N_{01}(N_{01})$;

$$F^-_1(x) = \{ f | f \in F_1 \text{ and } \forall t \in \mathbb{R}(\{4\}); \forall \xi \in N_{01}; [1] \Rightarrow [2] \}$$

$$[1] \quad \xi(4) = t(4) \text{ and } \xi(3) = f(t, \square)$$

$$[2] \quad [\partial_4 x(\xi)](4) + \sum_{i=1}^3 \partial_4 f(t, i) \cdot [\partial_i x(\xi)](4) < 0$$

$F^{+}_{2,n}$ の定義: $\forall n \in \mathbb{N}; \forall x \in N_{01}(N_{01})$;

$$F^{+}_{2,n}(x) = \{ f | f \in F_{2,n} \text{ and } \forall k \in \{1, \dots, n\}; f(\square, \square, k) \in F^+_1(x) \}$$

$F^{-}_{2,n}$ の定義: $\forall n \in \mathbb{N}; \forall x \in N_{01}(N_{01})$;

$$F^{-}_{2,n}(x) = \{ f | f \in F_{2,n} \text{ and } \forall k \in \{1, \dots, n\}; f(\square, \square, k) \in F^-_1(x) \}$$

$F^{+}_{4,n}$ の定義: $\forall n \in \mathbb{N}; \forall x \in N_{01}(N_{01})$;

$$F^{+}_{4,n}(x) = \{ f | f \in F_{4,n} \text{ and } f(N_{2,n}) \in F^{+}_{2,n}(x) \}$$

$F^{-}_{4,n}$ の定義: $\forall n \in \mathbb{N}; \forall x \in N_{01}(N_{01})$;

$$F^{-}_{4,n}(x) = \{ f | f \in F_{4,n} \text{ and } f(N_{2,n}) \in F^{-}_{2,n}(x) \}$$

$F^{+}_{6,n}$ の定義: $\forall n \in \mathbb{N}; \forall x \in N_{01}(N_{01})$;

$$F^{+}_{6,n}(x) = \{ f | f \in F_{6,n} \text{ and } f(N_{2,n}) \in F^{+}_{2,n}(x) \}$$

$F^{-}_{6,n}$ の定義: $\forall n \in \mathbb{N}; \forall x \in N_{01}(N_{01})$;

$$F^{-}_{6,n}(x) = \{ f | f \in F_{6,n} \text{ and } f(N_{2,n}) \in F^{-}_{2,n}(x) \}$$

$V_{\hat{3}}$ の定義: $\forall x \in N_{01}(N_{01}); \forall a \in \mathbb{R}; \forall \xi \in N_{01}; [1] \text{ and } [2]$

$$[1] \quad V_{\hat{3}}(\xi, x, a) \in F_{\hat{3}}(F_{\hat{3}})$$

$$[2] \quad \forall f \in F_{\hat{3}}; \forall (i, j) \in N_{0\hat{3}}; [\widehat{V}_{\hat{3}}([V_{\hat{3}}(\xi, x, a)](f))] (i, j) =$$

$$a \sum_{r=1}^4 \sum_{s=1}^4 [\partial_r x(\xi)](i) \cdot [\partial_s x(\xi)](j) \cdot [\widehat{V}_{\hat{3}}(f)](r, s)$$