

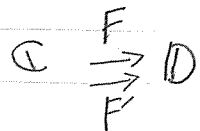
2017年度 数理科学III

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第4回数理科学 IIIA

Category

functor

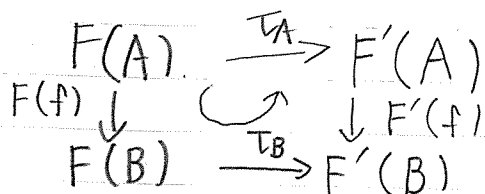


$A \xrightarrow{F} B$ in \mathcal{C}

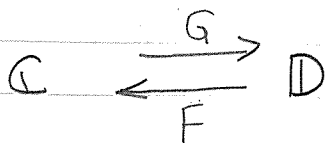
natural transformation

$$\eta_X = X \rightarrow GFX$$

$$\epsilon_A = FGA \rightarrow A$$



Adjointness



A in \mathcal{C}
 X in \mathcal{D}

bijection

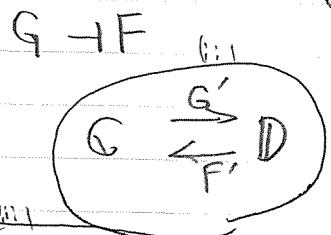
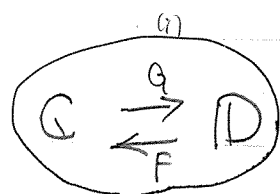
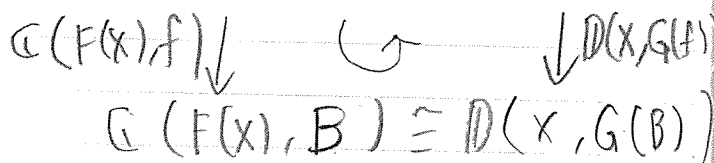
$$\mathcal{C}(F(X), A) \cong \mathcal{D}(X, G(A))$$

X & A is natural

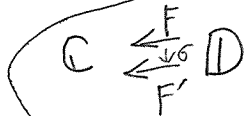
$A \xrightarrow{F} B$ in \mathcal{C}

A is natural

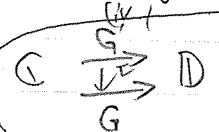
$$\mathcal{C}(F(X), A) \cong \mathcal{D}(X, G(A))$$



2つの adjointness adjunction 随伴



natural transformation



natural transformation

$$\begin{array}{ccc} \mathcal{C}(F'(X), A) \cong \mathcal{D}(X, G'(A)) & & \mathcal{C}(\sigma_X, A) \downarrow \uparrow \mathcal{D}(X, \tau_A) \\ \downarrow \uparrow & & \downarrow \uparrow \\ \mathcal{C}(F(X), A) \cong \mathcal{D}(X, G(A)) & & \end{array}$$

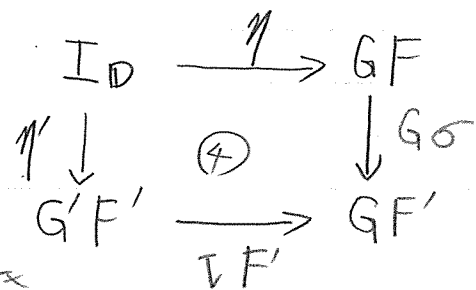
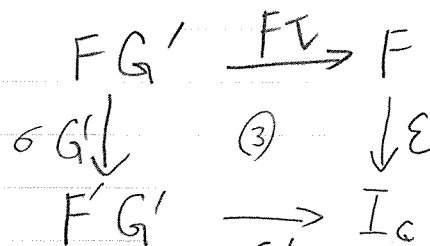
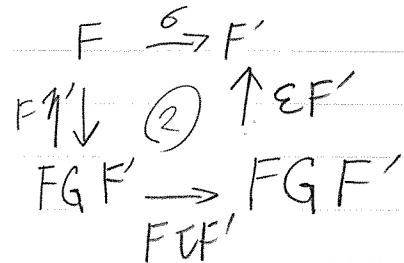
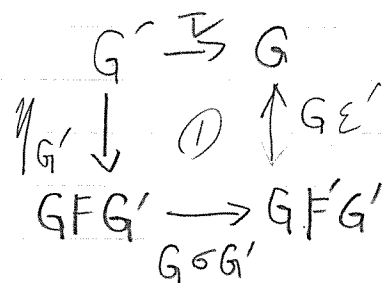
σ & τ is conjugate (共役)

Theorem (定理)

report (I)(II)

(I) σ & τ are conjugate \Leftrightarrow any one of the four following

diagrams (of natural transformation commutes)



(II) (a) σ, τ are conjugate if and only if natural transformation $\tau: G' \rightarrow G$ is uniquely determined,

(b) τ is uniquely determined

σ is uniquely determined

No. _____

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D: 証明 (1)

$$\mathbb{C}(FX, FX) \cong \mathbb{D}(X, GFX)$$

$\text{id}_{FX} \qquad \eta_X$

$$\mathbb{C}(FGA, A) \cong \mathbb{D}(GA, GA)$$

$\epsilon_A \qquad \text{id}_{GA}$

$$\mathbb{C}(FG'A, FG'A) \cong \mathbb{D}(G'A, GFG'A)$$

$$\mathbb{C}(FG'A, G'A) \xrightarrow{\text{id}_{FG'A}} \mathbb{C}(FG'A, FG'A) \xrightarrow{\eta_{G'A}} \mathbb{D}(G'A, GFG'A)$$

$$\mathbb{C}(FG'A, FG'A) \cong \mathbb{D}(G'A, GFG'A)$$

$$\mathbb{C}(FG'A, A)$$