



BUAP

FACULTAD DE CIENCIAS DE LA COMPUTACIÓN

Materia:

Fundamentos de la Programación

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Tarea: Tarea 2

Fecha: 29/Enero/ 2025

①

Disyunción Lógica:

$$A \vee B \equiv (\lambda x y. x (\lambda x y. x) y) A B$$

Turpa 2, Caso 1 $A = \text{True}$, $B = \text{True}$

$$\begin{aligned} (\lambda x y. x (\lambda x y. x) y) (\lambda x y. x) (\lambda x y. x) &\rightarrow (\lambda y. (\lambda x y. x) (\lambda x y. x) y) (\lambda x y. x) \\ &\rightarrow (\lambda x y. x) (\lambda x y. x) (\lambda x y. x) \\ &\rightarrow (\lambda x y. x) \rightarrow \text{True} \end{aligned}$$

Caso 2: $A = \text{False}$, $B = \text{True}$ entonces:

$$\begin{aligned} (\lambda x y. x (\lambda x y. x) y) A B &\rightarrow (\lambda x y. x (\lambda x y. x) y) (\lambda x y. y) (\lambda x y. x) \\ &\rightarrow (\lambda y. (\lambda x y. y) (\lambda x y. x) y) (\lambda x y. x) \\ &\rightarrow (\lambda x y. y) (\lambda x y. x) (\lambda x y. x) \\ &\rightarrow (\lambda x y. x) \rightarrow \text{True} \end{aligned}$$

Caso 3: $A = \text{True}$, $B = \text{False}$ entonces:

$$\begin{aligned} (\lambda x y. x (\lambda x y. x) y) A B &\rightarrow (\lambda x y. x (\lambda x y. x) y) (\lambda x y. x) (\lambda x y. y) \\ &\rightarrow (\lambda y. (\lambda x y. x) (\lambda x y. x) y) (\lambda x y. y) \\ &\rightarrow (\lambda x y. x) (\lambda x y. x) (\lambda x y. y) \\ &\rightarrow (\lambda x y. x) \rightarrow \text{True} \end{aligned}$$

Caso 4: $A = \text{False}$, $B = \text{False}$

$$\begin{aligned} (\lambda x y. x (\lambda x y. x) y) A B &\rightarrow (\lambda x y. x (\lambda x y. x) y) (\lambda x y. y) (\lambda x y. y) \\ &\rightarrow (\lambda x y. x (\lambda x y. x) y) (\lambda x y. y) (\lambda x y. y) \\ &\rightarrow (\lambda y. (\lambda x y. y) (\lambda x y. x) y) (\lambda x y. y) \\ &\rightarrow (\lambda x y. y) (\lambda x y. x) (\lambda x y. y) \\ &\rightarrow (\lambda x y. y) \rightarrow \text{False} \end{aligned}$$

(2)

Conjunción Lógica:

$$x \wedge y := (\lambda xy. xy (\lambda xy. y)) AB$$

Caso 1: $A = \text{True}$, $B = \text{True}$, ent:

$$\begin{aligned} (\lambda xy. xy (\lambda xy. y)) AB &\rightarrow (\lambda xy. xy (\lambda xy. y)) (\lambda xy. x) (\lambda xy. x) \\ &\rightarrow (\lambda y. (\lambda xy. x) y (\lambda xy. y)) (\lambda xy. x) \\ &\rightarrow (\lambda xy. x) (\lambda xy. x) (\lambda xy. y) \\ &\rightarrow (\lambda xy. x) \rightarrow \text{True} // \end{aligned}$$

Caso 2: $A = \text{True}$, $B = \text{False}$, tenemos:

$$\begin{aligned} (\lambda xy. xy (\lambda xy. y)) AB &\rightarrow (\lambda xy. xy (\lambda xy. y)) (\lambda xy. x) (\lambda xy. y) \\ &\rightarrow (\lambda y. (\lambda xy. x) y (\lambda xy. y)) (\lambda xy. y) \\ &\rightarrow (\lambda xy. x) (\lambda xy. y) (\lambda xy. y) \\ &\rightarrow (\lambda xy. y) \rightarrow \text{False} // \end{aligned}$$

Caso 3: $A = \text{False}$, $B = \text{True}$ tenemos:

$$\begin{aligned} (\lambda xy. xy (\lambda xy. y)) AB &\rightarrow (\lambda xy. xy (\lambda xy. y)) (\lambda xy. y) (\lambda xy. x) \\ &\rightarrow (\lambda y. (\lambda xy. y) y (\lambda xy. y)) (\lambda xy. x) \\ &\rightarrow (\lambda xy. y) (\lambda xy. x) (\lambda xy. y) \\ &\rightarrow (\lambda xy. y) \rightarrow \text{False} // \end{aligned}$$

Caso 4: $A = \text{False}$, $B = \text{False}$ tenemos:

$$\begin{aligned} (\lambda xy. xy (\lambda xy. y)) AB &\rightarrow (\lambda xy. xy (\lambda xy. y)) (\lambda xy. y) (\lambda xy. y) \\ &\rightarrow (\lambda y. (\lambda xy. y) y (\lambda xy. y)) (\lambda xy. y) \\ &\rightarrow (\lambda xy. y) (\lambda xy. y) (\lambda xy. y) \\ &\rightarrow (\lambda xy. y) \rightarrow \text{False} // \end{aligned}$$

③

Implicación Lógica

$$x \rightarrow y := (\lambda xy. (x \ y \ (\lambda xy. x))) \ A \ B$$

Caso 1: $A = \text{True}$, $B = \text{True}$ entonces:

$$\begin{aligned} (\lambda xy. xy \ (\lambda xy. x)) \ A \ B &\rightarrow (\lambda xy. xy \ (\lambda xy. x)) \ (\lambda xy. x) \ (\lambda xy. x) \\ &\rightarrow (\lambda y. (\lambda xy. x) \ y \ (\lambda xy. x)) \ (\lambda xy. x) \\ &\rightarrow (\lambda xy. x) \ (\lambda xy. x) \ (\lambda xy. x) \\ &\rightarrow (\lambda xy. x) \rightarrow \text{True} // \end{aligned}$$

Caso 2: $A = \text{False}$, $B = \text{True}$ entonces:

$$\begin{aligned} (\lambda xy. xy \ (\lambda xy. x)) \ A \ B &\rightarrow (\lambda xy. xy \ (\lambda xy. x)) \ (\lambda xy. y) \ (\lambda xy. x) \\ &\rightarrow (\lambda y. (\lambda xy. y) \ y \ (\lambda xy. x)) \ (\lambda xy. x) \\ &\rightarrow (\lambda xy. y) \ (\lambda xy. x) \ (\lambda xy. x) \\ &\rightarrow (\lambda xy. x) \rightarrow \text{True} // \end{aligned}$$

Caso 3: $A = \text{True}$, $B = \text{False}$ entonces:

$$\begin{aligned} (\lambda xy. xy \ (\lambda xy. x)) \ A \ B &\rightarrow (\lambda xy. xy \ (\lambda xy. x)) \ (\lambda xy. x) \ (\lambda xy. y) \\ &\rightarrow (\lambda y. (\lambda xy. x) \ y \ (\lambda xy. x)) \ (\lambda xy. y) \\ &\rightarrow (\lambda xy. x) \ (\lambda xy. y) \ (\lambda xy. x) \\ &\rightarrow (\lambda xy. y) \rightarrow \text{False} // \end{aligned}$$

Caso 4: $A = \text{False}$, $B = \text{False}$ entonces:

$$\begin{aligned} (\lambda xy. xy \ (\lambda xy. x)) \ A \ B &\rightarrow (\lambda xy. xy \ (\lambda xy. x)) \ (\lambda xy. y) \ (\lambda xy. y) \\ &\rightarrow (\lambda y. (\lambda xy. y) \ y \ (\lambda xy. x)) \ (\lambda xy. y) \\ &\rightarrow (\lambda xy. y) \ (\lambda xy. y) \ (\lambda xy. x) \\ &\rightarrow (\lambda xy. x) \rightarrow \text{True} // \end{aligned}$$