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```
A_{\times}1.\left(\varphi \longrightarrow (+\rightarrow \cdot \Psi)\right)
      let S. be. arbitrary truth-assignment. Then by let.

S[4-5 (4-59)] = 1+ S[4] + S[4].S[.1-54].
       . . . . . = 1+ S[4]+S[4]. (1+S[4]+S[4]S[4]).
       = 1+ S.E.43+SE.43+SE43+SE43*SE43
       Ax3. (74 \rightarrow 74) \rightarrow (7 \rightarrow 9)
                                                                                                                                                . . . . . . . . .
       = 1+ S.[74-37+]+ S[79-74] S[4-34].
= 1/4 (1/4 5 [74] + 5 [74] 5 [74] ) + (1+5 [74] + 5 [74] 5 [74]) (1+5 [4] + 5 [4] 5 [4] )
= (1+5[4])+(1+5[4](1+5[4])+(5[4])+(5[4]+5[4]+5[4])+5[4])
                                                                                                                                                     · (·1+·5[+]+5[+]5[4])·
 =1+5[4]+X+5[4]+5[4)+5[4]+5[4]+1+5[4]+5[4]5[4]
                                                                                                        + S[+] { + S[+] * + S[+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+] * [+]
Ax 2.
Lary to typeset.
```

1) (->) Trivial.

. (<-) prove by Contrapositive. For any S, if S[\$] \$ S[+],

· · · · · · · O S[6]=1 and S[+)=0, Concluding Ø # 4, or

2) S[\$]=0 and S[+]=1, Concluding + #\$

2) (-) For any S, Assume S satisfies M. Then.

S[\$\phi \gamma \chap ] = 1 + S[\$\phi] + S[\$\phi] \delta \text{! ther}

O \delta [\$\phi] = 0, Concluding \delta \text{!} \phi = 1+0+0=1, or

2) S[\$]=1, Concluding S satisfies MUEØZ, and by hypothesis S[4]=1. it Sollows S[0.77]=1+1+!=1.

(+) for any S, Assume S satisfies MUEDJ., Then S satisfies. also M. By hypothesis SEØ->43=1. Observe  $S[\phi \rightarrow t] = 1 + S[\phi] + S[\phi]S[t].$ 

= SETJ

1) let 5 be arbitrary.

Case (1). SEØ] = 0, Then SEØ > T.] = 1+0+0=1.

Gie(2). SEQJ=1, Then SEØ > TJ=1+1+1=1

2) Since +T, {\$3+T by fact.1.

By the deduction theorem, +(\$5).

By the Seduction theorem MUE 43 HT implies MH (9-3.4).

. . . . . . . . .

clearly DUM. F. P.

DVMH 4-14 by Fact 1

But {4, 4 > 4} H t using MP it follows  $\Delta UM + 1$  by fact 2

1) . Sy} V{P>+3+1 + 1 MP Contrad I. · léduetion とりろと (ヤーナナ)ー・ナ

 $+\left( \left( P\rightarrow T\right) \rightarrow t\right)$  deduction

 $\left\{ (\varphi \rightarrow t), (t \rightarrow \emptyset) \right\} \cup \left\{ \varphi \right\} + \emptyset \qquad \mathcal{MP} \qquad . \tag{4}$  $\{(\varphi \rightarrow +), (+\rightarrow \emptyset)\} \vdash (\varphi \rightarrow \emptyset)$  deduction

3) That's exactly the first example in page 39 of the notes.

[ (¬Ψ->Ψ)]U{74} H 7Y  $\{(\gamma P \rightarrow P)\} + P$ Contradiction  $+((\gamma P \rightarrow P) \rightarrow P)$ Lealuction

lemma. if MUET3 + t and +T, Then M+t

let d1, d21--, dn be the derivation of MUET3 + t, and

B11B21--1Pn be the derivation of +T

Consider  $\beta_1, \beta_2, \dots, \beta_n, \alpha_1, \alpha_2, \dots, \alpha_n$ . Then T in  $\{\alpha_i, \beta_i\}$  shall no longer be an assumption. in other words, it's a derivation from M. Since  $\beta_n = 1$ , clearly M + 1.

Le	j. "	= .4	ای ط		, } <sub>2</sub> ,	•	•	•	•	•	•
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•	Piji.	•	٠	٠	٠	٠	٠	۰	•	•	٠
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We	the give	u.a	lso f	) 1/81/1	'n	•	•	•	•	•	•

Construct a sequence

 $y_1, y_2, \dots, y_n$ 

from M, as B; EM are now deduced from M.