1. I. $\exists x \ni y \ (S(x,y) \lor S(y,x))$ Premise 2. $\exists y \ (S(a,y) \lor S(y,a))$ EI:1 3. $S(a,b) \lor S(b,a)$ EI:2 4. $S(a,b)$ Oisjunction elimination (Assumption 1) 5. $\exists y \ S(a,y)$ EG:5 7. $S(b,a)$ Oisjunction elimination (Assumption 2) 8. $\exists y \ S(b,y)$ EG:7 3. $\exists x \ni y \ S(x,y)$ EG:8 10. $\exists x \ni y \ S(x,y)$ EG:8 10. $\exists x \ni y \ S(x,y)$ Oisjunction elimination: (3), (4-b), (7-3) 10. $\exists x \ni y \ S(x,y)$ Premise 2. $\exists x \ 1 \ Q(x)$ Premise 3. $\forall x \ (R(x) \Rightarrow 7R(x))$ Premise 4. $P(a) \lor Q(a)$ VI:1 5. $1 Q(a) \Rightarrow P(a)$ Mesodelson Logic $[(Y \lor Q) \rightarrow (1Q \Rightarrow Y)]$ cule: 6. $7 Q(a) \Rightarrow P(a)$ Mesodelson Logic $[(Y \lor Q) \rightarrow (1Q \Rightarrow Y)]$ cule:		CENG 424
10: 2038804 Question 1) 1. 1. 1. 1. 3. 3. 3. 3.		HOMEWORK 5
10: 2038804 Question 1) 1. If $\exists x \exists y \ (S(x;y) \lor S(y,x))$ Premise 2. If $\exists x \exists y \ (S(a,y) \lor S(y,a))$ Et:1 3. $S(a,b) \lor S(b,a)$ Et:2 4. $S(a,b) \lor S(b,a)$ Ef:4 5. If $\exists x \exists y \ S(x,y)$ EG:5 7. $S(b,a)$ Disjunction elimination (Assumption 2) 8. If $\exists x \exists y \ S(x,y)$ EG:7 9. If $\exists x \exists y \ S(x,y)$ EG:8 10. If $\exists x \exists y \ S(x,y)$ Disjunction elimination: (3), (4-b), (7-3) 10. If $\exists x \exists y \ S(x,y)$ Disjunction elimination: (3), (4-b), (7-3) 2. If $\forall x \ (P(x) \lor P(x))$ Premise 2. If $\forall x \ (P(x) \lor P(x))$ Premise 3. If $\forall x \ (P(x) \lor P(x))$ Premise 4. If $\forall x \ (P(x) \lor P(x))$ Premise 5. If $\forall x \ (P(x) \lor P(x))$ Premise 6. If $\forall x \ (P(x) \lor P(x))$ Premise 7. If $\forall x \ (P(x) \lor P(x))$ Premise 8. If $\forall x \ (P(x) \lor P(x))$ Premise 9. If $\forall x \ (P(x) \lor P(x))$ Premise 10. If $\forall x \ (P(x) \lor P(x))$ Premise 11. If $\forall x \ (P(x) \lor P(x))$ Premise 12. If $\forall x \ (P(x) \lor P(x))$ Premise 13. If $\forall x \ (P(x) \lor P(x))$ Premise 14. If $\forall x \ (P(x) \lor P(x))$ Premise 15. If $\forall x \ (P(x) \lor P(x))$ Premise 16. If $\forall x \ (P(x) \lor P(x))$ Premise 17. If $\forall x \ (P(x) \lor P(x))$ Premise 18. If $\forall x \ (P(x) \lor P(x))$ Premise 19. If $\forall x \ (P(x) \lor P(x))$ Premise 20. If $\forall x \ (P(x) \lor P(x))$ Premise 21. If $\forall x \ (P(x) \lor P(x))$ Premise 22. If $\forall x \ (P(x) \lor P(x))$ Premise 23. If $\forall x \ (P(x) \lor P(x))$ Premise 24. If $\forall x \ (P(x) \lor P(x))$ Premise 25. If $\forall x \ (P(x) \lor P(x))$ Premise 26. If $\forall x \ (P(x) \lor P(x))$ Premise 27. If $\forall x \ (P(x) \lor P(x))$ Premise 28. If $\forall x \ (P(x) \lor P(x))$ Premise 29. If $\forall x \ (P(x) \lor P(x))$ Premise 20. If $\forall x \ (P(x) \lor P(x))$ Premise 20. If $\forall x \ (P(x) \lor P(x))$ Premise 21. If $\forall x \ (P(x) \lor P(x))$ Premise 22. If $\forall x \ (P(x) \lor P(x))$ Premise 23. If $\forall x \ (P(x) \lor P(x))$ Premise 24. If $\forall x \ (P(x) \lor P(x))$ Premise 25. If $\forall x \ (P(x) \lor P(x))$ Premise 26. If $\forall x \ (P(x) \lor P(x))$ Premise 27. If $\forall x \ (P(x) \lor P(x))$ Premise 28. If $\forall x \ (P(x) \lor P(x))$ Premise 29. If $\forall x \ (P(x) \lor P(x))$ Premise 20. If $\forall x \ (P(x) \lor P(x))$ Premise 20. If $\forall x \ (P(x) \lor P(x))$ Premise 21. If	Name	: Organ BASSIMSEK
Question 1) 1. 1. 1. 1. 1. 1. 1.		
1. Is $\exists x \exists y \ (S(x,y) \lor S(y,x))$ Premise 2. $\exists y \ (S(a,y) \lor S(y,a))$ EI:1 3. $S(a,b) \lor S(b,a)$ EI:2 4. $S(a,b)$ Ois junction elimination (Assumption 1) 5. $\exists y \ S(a,y)$ EG:5 7. $S(b,a)$ Ois junction elimination (Assumption 2) 8. $\exists y \ S(b,y)$ EG:7 3. $\exists x \exists y \ S(x,y)$ EG:8 10. $\exists x \exists y \ S(x,y)$ EG:8 10. $\exists x \exists y \ S(x,y)$ Ois junction elimination: (3), (4-b), (7-3) 10. $\exists x \exists y \ S(x,y)$ Ois junction elimination: (3), (4-b), (7-3) 2. $\exists x \ T \ Q(x)$ Premise 3. $\forall x \ (R(x) \Rightarrow T \ P(x))$ Premise 4. $P(a) \lor Q(a)$ UI:1 5. $T P(a) \Rightarrow P(a)$ Mesodelson Logic $[(Y \lor Q) \rightarrow (T \ P)]$ cule: 6. $T P(a) \Rightarrow P(a)$ Mesodelson Logic $[(Y \lor Q) \rightarrow (T \ P)]$ cule:		
1. $\exists x \exists y \ (S(x,y) \lor S(y,x))$ Premise 2. $\exists y \ (S(a,y) \lor S(y,a))$ EI:1 3. $S(a,b) \lor S(b,a)$ EI:2 4. $S(a,b) \lor S(b,a)$ EI:2 5. $\exists y \ S(a,y)$ EG:4 6. $\exists x \exists y \ S(x,y)$ EG:5 7. $S(b,a)$ Oisjunction elimination (Assumption 2) 8. $\exists y \ S(b,y)$ EG:7 9. $\exists x \exists y \ S(x,y)$ EG:8 10. $\exists x \exists y \ S(x,y)$ EG:8 11. $\forall x \ (P(x) \lor P(x))$ Premise 2. $\exists x \ P(x)$ Premise 3. $\forall x \ (R(x) \Rightarrow P(x))$ Premise 4. $P(a) \lor P(a)$ Premise 5. $P(a) \Rightarrow P(a)$ Merdelson Logic $[(Y \lor Q) \rightarrow (P(a) \Rightarrow Y)]$ rule: 6. $P(a) \Rightarrow P(a)$ Mersoleson Logic $[(Y \lor Q) \rightarrow (P(a) \Rightarrow Y)]$ rule:		STION TU
2. $3y (S(a,y) \vee S(y,a))$ EI:1 3. $S(a,b) \vee S(b,a)$ E1:2 4. $S(a,b) \vee S(b,a)$ E6:4 5. $3y S(a,y)$ E6:4 6. $3x3y S(x,y)$ E6:5 7. $S(b,a)$ Oisjunction elimination (Assumption 2) 8. $3y S(b,y)$ E6:8 9. $3x3y S(x,y)$ E6:8 10. $3x3y S(x,y)$ Oisjunction elimination: (3), (4-b), (7-3) • 2. 1. $\forall x (P(k) \vee P(k))$ Premise 2. $3x \exists P(x)$ Premise 3. $\forall x (R(x) \Rightarrow \exists P(x))$ Premise 4. $P(a) \vee P(a)$ UI:1 5. $\exists P(a) \Rightarrow P(a)$ Mendelson Logic $[(\forall \vee P) \Rightarrow (\exists P \Rightarrow V)]$ rule: 6. $\exists P(a) \Rightarrow P(a)$ MP:5,6	1.	1. Jx 74 (S(x,y) v S(y,x)) Premise
3. $S(a,b) \vee S(b,a)$ EI:2 4. $S(a,b)$ Disjunction elimination (Assumption 1) 5. $3y S(a,y)$ EG:4 6. $3x3y S(x,y)$ EG:5 7. $S(b,a)$ Disjunction elimination (Assumption 2) 8. $3y S(b,y)$ EG:7 9. $3x3y S(x,y)$ EG:8 10. $3x3y S(x,y)$ Disjunction elimination: (3), (4-b), (7-9) 11. $\forall x (P(a) \vee P(x))$ Premise 2. $3x \exists y S(x)$ Premise 3. $\forall x (R(x) \Rightarrow \neg P(x))$ Premise 4. $P(a) \vee P(a)$ UI:1 5. $\neg P(a) \Rightarrow P(a)$ Mendelson Logic $[(\psi \vee \psi) \rightarrow (\neg \psi \Rightarrow \psi)]$ rule: 6. $\neg P(a) \Rightarrow P(a)$ Mesoleson Logic $[(\psi \vee \psi) \rightarrow (\neg \psi \Rightarrow \psi)]$ rule:		
4. $S(a,b)$ Disjunction elimination (Assumption 1) 5. $3y S(a,y) = 66:4$ 6. $3x3y S(x,y) = 66:5$ 7. $S(b,a)$ Disjunction elimination (Assumption 2) 8. $3y S(b,y) = 66:7$ 9. $3x3y S(x,y) = 66:8$ 10. $3x3y S(x,y) = 66:8$ 10. $3x3y S(x,y) = 66:8$ 2. 1. $\forall x (P(x) \lor Q(x)) = P(x) = P(x) = P(x) = P(x)$ 7. $\forall x (P(x) \lor Q(x)) = P(x) =$		
5. $\exists y \in (a,y)$ $\exists G : G : G : G : G : G : G : G : G : G $		- - - - - - - - - -
6. $\exists x \exists y \ S(x,y)$ $\not = G:S$ 7. $S(6,a)$ $O:syunction$ elimination (Assumption 2) 8. $\exists y \ S(b,y)$ $EG:7$ 9. $\exists x \exists y \ S(x,y)$ $EG:8$ 10. $\exists x \exists y \ S(x,y)$ $O:syunction$ elimination: (3), (4-b), (7-3) 11. $\forall x \ (PR) \lor P(x)$) $Premise$ 2. $\exists x \ P(x)$ $Premise$ 3. $\forall x \ (R(x) \Rightarrow P(x))$ $Premise$ 4. $P(a) \lor P(a)$ $Premise$ 4. $P(a) \lor P(a)$ $Premise$ 5. $P(a) \Rightarrow P(a)$ $Premise$ 6. $P(a) \Rightarrow P(a)$ $Premise$ 6. $P(a) \Rightarrow P(a)$ $Premise$ 7. $P(a) \Rightarrow P(a)$ $Premise$		
7. $S(6,a)$ Disjunction elimination (Assumption 2) 8. $3y S(6,y) = EG:7$ 9. $3x3y S(x,y) = EG:8$ 10. $3x3y S(x,y) = 0$ Oisjunction elimination: (3), $(4-6)$, $(7-3)$ • 2. $1. \forall x (P(6)) \lor Q(x)) = 0$ Premise 2. $3x \lor Q(x) = 0$ Premise 3. $\forall x (R(x) \Rightarrow \neg P(x)) = 0$ Premise 4. $P(a) \lor Q(a) = 0$ UT:1 5. $1Q(a) \Rightarrow P(a) = 0$ Mendelson Logic $[(Y \lor Q) \rightarrow (\neg Q \Rightarrow Y)]$ rule: 6. $\neg Q(a) = ET:2$ 7. $P(a) = 0$ MP: $S, 6$		
8. $3y S(b,y) EG:7$ 9. $3x3y S(x,y) EG:8$ 10. $3x3y S(x,y) Oisjunction elimination: (3), (4-b), (7-3)$ • 2. 1. $\forall x (P(x) \lor Q(x)) Premise$ 2. $3x 7 Q(x) Premise$ 3. $\forall x (R(x) \Rightarrow 7P(x)) Premise$ 4. $P(a) \lor Q(a) UI:1$ 5. $7P(a) Premise Premise$ 6. $7P(a) EI:2$ 7. $P(a) Premise $		6. $\exists x \exists y S(x,y)$
9. $3\times 3y \le (x,y) = EG:8$ 10. $3\times 3y \le (x,y) = 0$ is junction elimination: (3), (4-6), (7-9) 2. 1. $\forall x : (P(x) \lor P(x)) = P(x)$ Premise 2. $3\times 1P(x) = P(x) = P(x)$ Premise 4. $P(x) \lor P(x) = P(x) = P(x)$ 5. $1P(x) = P(x) = P(x) = P(x)$ 6. $1P(x) = P(x) = P(x) = P(x)$ 7. $1P(x) = P(x) = P(x) = P(x)$ 10. $1P(x) = P(x) = P(x) = P(x)$ 11. $1P(x) = P(x) = P(x) = P(x)$ 12. $1P(x) = P(x) = P(x)$ 13. $1P(x) = P(x) = P(x)$ 14. $1P(x) = P(x) = P(x)$ 15. $1P(x) = P(x) = P(x)$ 16. $1P(x) = P(x) = P(x)$ 17. $1P(x) = P(x) = P(x)$ 18. $1P(x) = P(x) = P(x)$ 19. $1P(x) = P(x)$ 10. $1P(x) = P(x)$ 11. $1P(x) = P(x)$ 12. $1P(x) = P(x)$ 13. $1P(x) = P(x)$ 14. $1P(x) = P(x)$ 15. $1P(x) = P(x)$ 16. $1P(x) = P(x)$ 17. $1P(x) = P(x)$ 18. $1P(x) = P(x)$ 19. $1P(x) = P(x)$ 10. $1P(x) = P(x)$ 11. $1P(x) = P(x)$ 12. $1P(x) = P(x)$ 13. $1P(x) = P(x)$ 14. $1P(x) = P(x)$ 15. $1P(x) = P(x)$ 16. $1P(x) = P(x)$ 17. $1P(x) = P(x)$ 18. $1P(x) = P(x)$ 19. $1P(x) = P(x)$ 20. $1P(x) = P(x)$ 21. $1P(x) = P(x)$ 22. $1P(x) = P(x)$ 23. $1P(x) = P(x)$ 24. $1P(x) = P(x)$ 25. $1P(x) = P(x)$ 26. $1P(x) = P(x)$ 27. $1P(x) = P(x)$ 28. $1P(x) = P(x)$ 29. $1P(x) = P(x)$ 20. $1P(x) = P(x)$ 21. $1P(x) = P(x)$ 22. $1P(x) = P(x)$ 23. $1P(x) = P(x)$ 24. $1P(x) = P(x)$ 25. $1P(x) = P(x)$ 26. $1P(x) = P(x)$ 27. $1P(x) = P(x)$ 28. $1P(x) = P(x)$ 29. $1P(x) = P(x)$ 2		7. S(b,a) Disjunction elimination (Assumption 2)
10. $\exists \times \exists y \ S(\times, y)$ Disjunction elimination: (3) , $(4-b)$, $(7-3)$ 2. 1. $\forall \times (P(x) \lor Q(x))$ Premise 2. $\exists \times \exists \lor Q(x)$ Premise 3. $\forall \times (R(x) \Rightarrow \exists P(x))$ Premise 4. $P(a) \lor Q(a)$ UI:1 5. $\exists P(a) \Rightarrow P(a)$ Mendelson Logic $[(Y \lor Q) \rightarrow (\exists Q \Rightarrow Y)]$ rule: 6. $\exists Q(a) \Rightarrow P(a)$ MP: 5, 6		8. 3y S(b,y) EG:7
• 2. 1. $\forall x \ (P(x) \lor Q(x))$ Premise 2. $\exists x \exists Q(x)$ Premise 3. $\forall x \ (R(x) \Rightarrow \exists P(x))$ Premise 4. $P(a) \lor Q(a)$ UI:1 5. $\exists Q(a) \Rightarrow P(a)$ Mendelson Logic $[(\psi \lor \varphi) \to (\exists \varphi \Rightarrow \psi)]$ rule: 6. $\exists Q(a) = EI:2$ 7. $P(a) = P(a)$ MP: 5, 6		3. $3 \times 3 y S(x,y) E G:8$
• 2. 1. $\forall x \ (P(x) \lor Q(x))$ Premise 2. $\exists x \exists Q(x)$ Premise 3. $\forall x \ (R(x) \Rightarrow \exists P(x))$ Premise 4. $P(a) \lor Q(a)$ UI:1 5. $\exists Q(a) \Rightarrow P(a)$ Mendelson Logic $[(\psi \lor \varphi) \to (\exists \varphi \Rightarrow \psi)]$ rule: 6. $\exists Q(a) = EI:2$ 7. $P(a) = P(a)$ MP: 5, 6		
1. $\forall x \ (P(x) \lor P(x))$ Premise 2. $\exists x \lor P(x)$ Premise 3. $\forall x \ (R(x) \Rightarrow \neg P(x))$ Premise 4. $P(a) \lor P(a)$ UT:1 5. $\neg P(a) \Rightarrow P(a)$ Mendelson Logic $[(\psi \lor \varphi) \rightarrow (\neg \varphi \Rightarrow \psi)]$ rule: 6. $\neg P(a) \Rightarrow P(a)$ MP: 5, 6		10. $\exists \times \exists y \ S(x,y)$ Disjunction elimination: (3), (4-6), (7-3)
1. $\forall x \ (P(x) \lor P(x))$ Premise 2. $\exists x \lor P(x)$ Premise 3. $\forall x \ (R(x) \Rightarrow \neg P(x))$ Premise 4. $P(a) \lor P(a)$ UT:1 5. $\neg P(a) \Rightarrow P(a)$ Mendelson Logic $[(\psi \lor \varphi) \rightarrow (\neg \varphi \Rightarrow \psi)]$ rule: 6. $\neg P(a) \Rightarrow P(a)$ MP: 5, 6		
3. $\forall x \ (R(x) \Rightarrow \neg P(x))$ Premise 4. $P(a) \lor Q(a) \lor UI:1$ 5. $\neg Q(a) \Rightarrow P(a)$ Mendelson Logic $[(\psi \lor \varphi) \rightarrow (\neg \varphi \Rightarrow \psi)]$ rule: 6. $\neg Q(a) = EI:2$ 7. $P(a) = MP: S, 6$		1. $\forall x (P(x) \lor Q(x))$ Premise
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		2. 3x 7 Q(x) Premise
5. $\neg \rho(a) \Rightarrow \rho(a)$ Mendelson Logic $[(\psi \lor \phi) \rightarrow (\neg \phi \Rightarrow \psi)]$ rule: 6. $\neg \rho(a)$ EI:2 7. $\rho(a)$ MP: 5, 6		3. $\forall x (R(x) \Rightarrow \neg P(x))$ Premise
6. 79(a) EI:2 7. P(a) MP: 5,6		
7, P(a) MP: 5, 6		5. $\neg \varphi(a) \Rightarrow \varphi(a)$ Mendelson Logic $[(\psi \lor \varphi) \rightarrow (\neg \varphi \Rightarrow \psi)]$ rule:
		6. 70(a) EI:2
		7, P(a) MP: 5, 6
		8. $R(a) \Rightarrow \neg P(a)$ UI:3
9, ¬R(a) MT: 7,8		
10. 3x7R(x) EG:9	-	

3.	We	can use R	elational	Deduction	Theorem	on this
oroblen	n b	ecause 3y	\$(y) ho	s no fo	ee variable	and it co
oe a	dded	to set of	premises	D. And	now, we	need to
deduct	A,	(F(x).				
i.e.	by	using Rela	tional De	duction	Theorem:	
		$(S(y) \Rightarrow F(y)$				
		Δ			¥	
	0.00	be change				
		$(219) \Rightarrow F(x)$		S(4) H	V×F(x)	
l	V V J	<u>\(\)</u>			Y	
			{	Φ5	7	
The	refor	e,				
	1	∀× ∀y (S(y)	$\Rightarrow F(x)$	Premis	e	
	2.	3y S(y)		Premise (from Relation	nal Deduction
	3.	yy (S(y) =	⇒ F(a))	UI:1		
	4,	$S(b) \Rightarrow F(a)$	۵) ا	UI:3		
	5.	2 (P)	ET:	2		
	6.	F(a)	MP: 4,			
	7.	Vx F(x)	UG:6			
0	stion	2)				
	ep 1					
		yone whom	Jage le	ves /3 4	traveler.	
•		/x (Loves (
4 4	•	X (CONEZ (Vane, A)			

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Any person who does not earn money, does not travel.
      Yy ((PERSON(y) A TEARN(y)) => TRAVEL(y))
     Jim is a doctor
       DOCTOR (JIM)
    · Every doctor is a person.
       Yz ( DOCTOR (Z) → PERSON(Z))
    · Any doctor who does not work, does not earn money.
       Yu ((OOCTOR(4) ∧ TWORK(4)) => TEARN(4))
    · Anyone who does not travel, is not a traveler.
       YV (TRAVEL (V) => TRAVELER(V))
    For the conclusion:
    . If Jim does not work, then Jone does not love Jim.
  Goal: TWORK (Jim) => TLOVES (Jane, Jim)
  Negated Goal: 7 (Twork (Jim) => TLOVES (Jane, Jim))
                 7 ( WORK (Jim) V 7 LOVES (Jane, Jim))
                   TWORK (Jim) A LOVES (Jane, Jim)
 Step 2)
* For first sentence:
      Yx (LOVES (Jane,x) => TRAVELER(x))
      Vx (7LOVES (Jone,x) V TRAVELER(x))
          7 LOVES (Jone, x) V TRAVELER (x)
  As clause: { TLOVES (Jane, x), TRAVELER (x)}
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For second sentence:
*
    yy ((PERSON(y)) ∧ TEARN(y)) ⇒ TTRAVEL(y))
    Yy (7 (PERSONLY) N TEARNLY)) V TTRAVELLY))
     YY ((TPERSON(y) V EARN(y)) V TRAVEL(y))
        ((TPERSON(y) V EARN(y)) V TTRAVELLY)
  As clause: { TPERSON(y), EARN(y), TRAVEL(y)}
* For third sentence:
      DOCTOR (Jim)
    As clause: { DOCTOR (Jim) }
* For fourth sentence:
     YZ ( DOCTOR (Z) => PERSON(Z))
      42 (700CTOR(2) , PERSON(2))
        7 DOCTOR (Z) V PERSON(Z)
    As clause: { 7 DOCTOR(2), PERSON(2) }
 * For fifth sentence:
     Yy ((DOCTOR(4) A TWORK(4)) => TEARN(4))
     YU (7 (DOCTOR(4) A TWORK(4)) V TEARN(4))
     My ((700 CTOR(u) V WORK(u)) V TEARN(u))
         (700CTOR(4) V WORK(4)) V TEARN(4)
   As clouse: { 700CTOR(4), WORK(4), 7EARN(4)}
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T.

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* For sixth sentence:
           VV (TRAVEL (V) => TRAVELER(V))
           YV ( TRAVEL (V) V TTRAVELER (V))
               TRAVEL (V) V TTRAVELER (V)
         As clause: {TRAVEL (V), TTRAVELER(V)3
       * For negated goal we already found:
              TWORK (Jim) A LOVES (Jane, Jim)
          As clouse: { TwoRK(Jim)}
[ LOVES (Jane, Jim) ]
        Step 3)
       1. [ 7 LOVES (Jane, x), TRAVELER(x)} Premise
       2. { TPERSON(y), EARN(y), TTRAVEL(y) 3 Premise
                                           Premise
       3. F DOCTOR (Jim) &
       4. {700CTOR(2), PERSON(2)}
                                           Premise
          § 7 DOCTOR (4), WORK (4), TEARN (4) } Premise
T
          {TRAVEL (V), TRAVELER (V) }
                                            Premise
                                      Negated Goal
          F TWORK (Jim) 3
          { Loves (Jane, Jim) }
                                      Negated Goal
                             3,4 by substituting { Z < Jim }
          { PERSON (Jim) }
           [ EARN (Jim), TRAVEL (Jim) & 2,9 by substituting & y & Jim}
       10.
                                       by substituting {x < Jim }
          ETRAVELER (Jim) 3
                                1,8
      11.
                             6,11 by substituting & v = Jim3
      12. ETRAVEL (Jim) 3
      13. EEARN (Jim) 3
                             10, 12
      14. [ WORK (Jim), TEARN (Jim) 3 3,5 by substituting [u = Jim]
      15. { WORK (Jim) }
                             13,14
       16. 7 3
                      7,15
```

As a result, since we read we proved the goal.	hed empty set {3 at the end,
Question 3)	
	x,y,p) represents a transition
rom x to y with probability	
* According to Hint 2,	
$P(x,y,\rho_1) \wedge P(y,z,\rho_2)$	$\Rightarrow \rho(\times, \Xi, \rho_1 \times \rho_2)$
$= \neg P(x,y,\rho_1) \vee \neg P(y,$	
	, 7ρ(y,z,ρ,), ρ(x,z,ρ,×ρ) }
By using resolution and	answer extraction method:
1. { ρ(ρ, 9, 0.8) }	P(p,q, 0.8) from the tree
2. { P(q, t, 0.3) }	P(q,t,0.3) from the tree
3. { 7P(x,y,p1), 7P(y,z,p2),	$P(x,z,\rho_1x\rho_2)$ from Hint 2
4. {7P(p,t,w), goal(w)}	(to reach the probability w
	by starting from node p and ending at node t)
5. { ¬P(p,y,p1), ¬P(y,t,p2)	
5. 1. 11 (9, 4, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	(by substituting
	$\{x \in P, z \in t, w \in P_4 \times P_2\}$
6. { 7 P(q,t, p2), goal (0.8	× e ₂) 3 1,5
	× ρ2) \$ 1,5 (by substituting { y < q, ρ1 < 0.83})
7. 1 goal (0.8 x 0.3) }	2, b (by substituting £P2 €0.3
The result is: 0.8 x 0.3	= 0.24

Question	4)		
we k	now that	universal gene	eralization is φ
* Here , :	f bounded	variable (v)	of universal quantifier
occu	os in Q	, this rule	e may not work.
			as $\varphi(x) = x > 2y$
and if	we say	that Vy Q	, it is clearly false
because	Vy Q =	Vy (y>2y)	, and this is not sound.
			can not use universal
		arting with	
		t's sog Q	
			, but starting with this,
	not say		e for this case.
Again	√n @ /3	clearly tall	e for this case.
* So, e	except these	coses, uni	versal generalization can work
			c, we con generalize it
		other assu	
The contract of the contract o			>1 \Rightarrow x-1>0) prove it for arbitrary c,
		eneralize it	
	2		A× Ø