CS F214 Logic in Computer Science I Semester 2021-2022

Tutorial 3 Solutions

Premise
Assumption /\ i 1,2
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$p \vdash (p \rightarrow q) \rightarrow q$

1. p

2. $p \rightarrow q$

3. q

4. $(p \rightarrow q) \rightarrow q$

Premise

Assumption

→e 2,1

$(p\rightarrow r) \land (q\rightarrow r) \vdash (p \land q) \rightarrow r$

1.
$$(p \rightarrow r) \land (q \rightarrow r)$$

2.
$$p \rightarrow r$$

$$3.p \wedge q$$

- 4. p
- 5. r
- 6. $(p \land q) \rightarrow r$

Premise

$$\Lambda e_1 1$$

Assumption

$$\Lambda e_1 3$$

$\neg p \rightarrow \neg q \vdash q \rightarrow p$

1. $\neg p \rightarrow \neg q$

Premise

2. q

Assumption

3. ¬р

Assumption

4. ¬q

→e 3,1

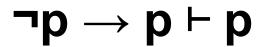
5. ⊥

¬e 2,4

6. p

PBC 3-5

7. $q \rightarrow p$



1. $\neg p \rightarrow p$

Premise

2.¬p

3.p

4. ⊥

Assumption

→e 2,1

¬e 2,3

5. p

PBC 2-4



1. ¬p	Premise
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2. p

Assumption

3. ⊥

¬e 2,1

4. q

⊥e3

5.
$$p \rightarrow q$$

p ∨ q, ¬q ⊢ p

1. p V q

2. ¬q

3. p

4. p

Premise

Premise

Assumption

Copy 3

5. q

6. ⊥

7. p

8. p

Assumption

¬ e 2,5

⊥e6

Ve 1, 3-4, 5-7

$\vdash \neg p \rightarrow (p \rightarrow (p \rightarrow q))$

1. ¬p

Assumption

- 2. p
- 3. ⊥
- 4. p→q

Assumption

- ¬e 2,1
- **⊥**e3

5. $p \rightarrow (p \rightarrow q)$

- \rightarrow i 2-4
- 6. $\neg p \rightarrow (p \rightarrow (p \rightarrow q)) \rightarrow i 1-5$

$p \land \neg p \vdash \neg (r \rightarrow q) \land (r \rightarrow q)$

- 1. p ∧ ¬p
- 2. p
- 3. ¬р
- 4. ⊥
- 5. $\neg (r \rightarrow q) \land (r \rightarrow q)$

Premise

$$\Lambda e_1 1$$

$$\Lambda e_2 1$$

$\neg(p \rightarrow q) \vdash q \rightarrow p$

1.¬(p	\longrightarrow	q)
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Premise

2. q

Assumption

3. p

Assumption

4. q

Copy 2

5. $p \rightarrow q$

→i 3-4

6. ⊥

¬e 5,1

7. p

⊥e6

Thank You