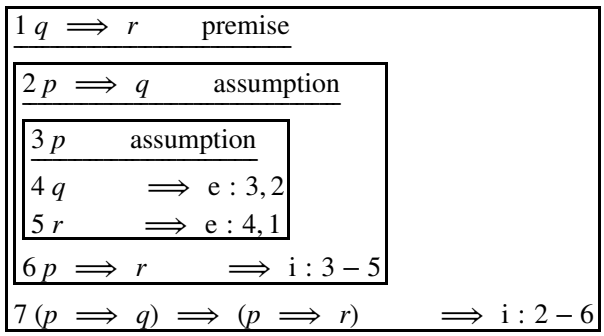
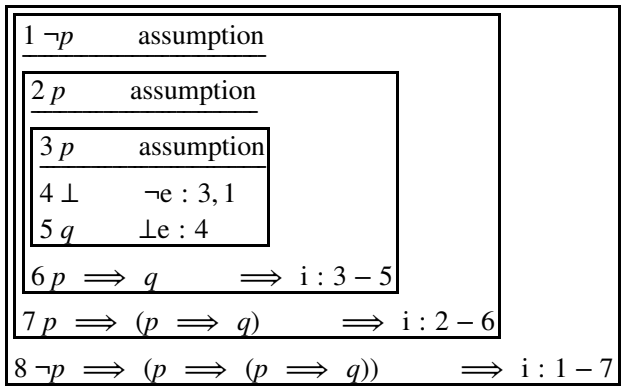
Homework 1

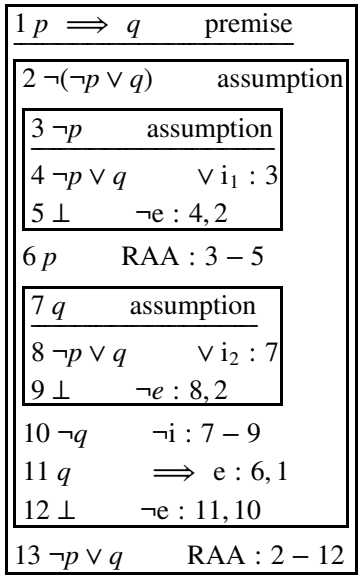
1.



2.



3.



4.

1 $(s \implies p) \vee (t \implies q)$ premise

2 $s \implies p$ assumption

3 $s \vee \neg s$ LEM

4 s	assumption
5 p	$\implies$ e : 4, 2
6 $\neg s \vee p$	$\vee$ i$_2$: 5

7 $\neg s$	assumption
8 $\neg s \vee p$	$\vee$ i$_1$: 7

9 $\neg s \vee p$ $\vee$ e : 3, 4 – 6, 7 – 8

10 $\neg s$	assumption
11 s	assumption
12 $\bot$	$\neg$e : 11, 10
13 q	$\bot$e : 12
14 $s \implies q$	$\implies$ i : 11 – 13
15 $(s \implies q) \vee (t \implies p)$	$\vee$ i$_1$: 14

16 p	assumption
17 t	assumption
18 p	
19 $t \implies p$	$\implies$ i : 17 – 18
20 $(s \implies q) \vee (t \implies p)$	$\vee$ i$_2$: 19

21 $(s \implies q) \vee (t \implies p)$ $\vee$ e : 9, 10 – 15, 16 – 20

22 $t \implies q$ assumption

23 $t \vee \neg t$ LEM

24 t	assumption
25 q	$\implies$ e : 24, 22
26 $\neg t \vee q$	$\vee$ i$_2$: 25

27 $\neg t$	assumption
28 $\neg t \vee q$	$\vee$ i$_1$: 27

29 $\neg t \vee q$ $\vee$ e : 23, 24 – 26, 27 – 28

30 $\neg t$	assumption
31 t	assumption
32 $\bot$	$\neg$e : 31, 30
33 p	$\bot$e : 32
34 $t \implies p$	$\implies$ i : 31 – 33
35 $(s \implies q) \vee (t \implies p)$	$\vee$ i$_2$: 34

36 q	assumption
37 s	assumption
38 q	
39 $s \implies q$	$\implies$ i : 37 – 38
40 $(s \implies q) \vee (t \implies p)$	$\vee$ i$_1$: 39

41 $(s \implies q) \vee (t \implies p)$ $\vee$ e : 29, 30 – 35, 36 – 40

42 $(s \implies q) \vee (t \implies p)$ $\vee$ e : 1, 2 – 21, 22 – 41

5.

1 $(p \wedge q) \implies r$ premise

2 $r \implies s$ premise

3 $q \wedge \neg s$ premise

4 $\neg s$ $\wedge$ e$_2$: 3

5 $\neg r$ MT : 2, 4

6 $\neg(p \wedge q)$ MT : 1, 5

7 p	assumption
8 q	$\wedge$ e$_1$: 3
9 $p \wedge q$	$\wedge$ i : 7, 8
10 $\bot$	$\neg$e : 9, 6

11 $\neg p$ $\neg$i : 7 – 10