PY2010 Intermediate Logic
UNIVERSITY OF ST ANDREWS
Exercises Week 02

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September 24, 2021

I hereby declare that the attached piece of written work is my own work and that I have not reproduced, without acknowledgement, the work of another.

1 $\quad p \supset q, p \supset r \vdash_{NC} p \supset (q \wedge r)$

1	(1)	$p \supset q$	Ass (Premise)
2	(2)	$q \supset r$	Ass (Premise)
3	(3)	p	Ass ($\supset E$)
1,3	(4)	q	1,3, $\supset E$
2,3	(5)	r	2,3, $\supset E$
1,2,3	(6)	$q \wedge r$	4,5,$\wedge I$
1,2	(7)	$p \supset (q \wedge r)$	3,6,$\supset I$

2 $\quad p \wedge q, q \supset r \vdash_{NC} p \wedge r$

1	(1)	$p \wedge q$	Ass (Premise)
2	(2)	$q \supset r$	Ass (Premise)
1	(3)	p	1, $\wedge E$
1	(4)	q	1, $\wedge E$
1,2	(5)	r	2,4, $\supset E$
1,2	(6)	$p \wedge r$	3,5, $\wedge I$

3 $\quad \vdash_{NC} (p \supset q) \supset ((q \supset r) \supset (p \supset r))$

1	(1)	p	Ass ($\supset I$)
2	(2)	r	Ass ($\supset I$)
2	(3)	$p \supset r$	1,2, $\supset I$
4	(4)	q	Ass ($\supset I$)
2	(5)	$q \supset r$	2,4, $\supset I$
	(6)	$((q \supset r) \supset (p \supset r))$	3,5, $\supset I$
4	(7)	$p \supset q$	1,4, $\supset I$
	(8)	$(p \supset q) \supset ((q \supset r) \supset (p \supset r))$	7,8 $\supset I$

4 $p \wedge q \vdash_{NC} q \wedge p$

1	(1)	$p \wedge q$	Ass (Premise)
1	(2)	p	$1, \wedge E$
1	(3)	q	$1, \wedge E$
1	(4)	$q \wedge p$	$2, 3, \wedge I$

5 $p \supset (p \supset q) \vdash_{NC} p \supset q$

1	(1)	$p \supset (p \supset q)$	Ass (Premise)
2	(2)	p	Ass $(\supset E)$
1,2	(3)	$p \supset q$	$1, 2, \supset E$
1,2	(4)	q	$2, 3, \supset E$
1	(5)	$p \supset q$	$2, 4, \supset I$