HW#3 M325K

SECTION 2.3 SOLUTIONS SPRING 2024

#42 List of Given Premises:

a) $p \vee q$
b) $q \rightarrow r$
c) $(p \wedge s) \rightarrow t$
d) $\sim r$
e) $\sim q \rightarrow (u \wedge s)$

To Deduce: t

DEDUCTION:

	STATEMENT	JUSTIFICATION
1)	$q \rightarrow r$	by premise (b)
	$\sim r$	by premise (d)
	$\therefore \sim q$	by Modus Tollens
2)	$p \vee q$	by premise (a)
	$\sim q$	by argument (1)
	$\therefore p$	by Elimination
3)	$\sim q \rightarrow (u \wedge s)$	by premise (e)
	$\sim q$	by argument (1)
	$\therefore (u \wedge s)$	by Modus Ponens

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Sec 2.3

#42 (Continued)

	STATEMENT	JUSTIFICATION
4.)	$\frac{u \wedge s}{\therefore s}$	by argument (3) / by Specialization
5.)	$\frac{p}{s}$ / $\therefore p \wedge s$	by argument (2) / by argument (4) / by Conjunction
6.)	$\frac{(p \wedge s) \rightarrow t \quad (p \wedge s)}{\therefore t}$	by premise (c) / by argument (5) / by Modus Ponens.

Sec 2.3

#43 List of given premises:

a) $\sim p \rightarrow (r \wedge \sim s)$
b) $t \rightarrow s$
c) $u \rightarrow \sim p$
d) $\sim w$
e) $u \vee w$

To Deduce: $\sim t$

Deduction:

STATEMENT	JUSTIFICATION
1) $\sim w$	by Premise (d)
$u \vee w$	by Premise (e)
$\therefore u$	by Elimination
2) $u \rightarrow \sim p$	by Premise (c)
u	by Argument (1)
$\therefore \sim p$	by modus ponens
3) $\sim p \rightarrow (r \wedge \sim s)$	by Premise (a)
$\sim p$	by Argument (2)
$\therefore r \wedge \sim s$	by modus ponens

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#43 (continued)

	STATEMENT	JUSTIFICATION
4)	$r \wedge \sim s$	by Argument (3)
	$\therefore \sim s$	by Specialization
5)	$t \rightarrow s$	by Premise (6)
	$\sim s$	by argument (4)
	$\therefore \sim t$	by Modus tollens.

See an alternate solution on the next page.

Sec 2.3, #43 ALTERNATE SOLUTION

1) $\sim U \rightarrow W$ — by Premise (e) Equivalence using the Double Negative Law and the OR-Form "$p \rightarrow q \equiv \sim p \vee q$"

$\sim W$ — by Premise (d)

$\therefore \sim\sim U$ — by Modus Tollens

2) $\sim U \vee \sim p$ — by Premise (c) Equivalence using "$p \rightarrow q \equiv \sim p \vee q$".

$\sim\sim U$ — by argument (1)

$\therefore \sim p$ — by Elimination

3) $\sim p \rightarrow (r \wedge \sim s)$ — by premise (a)

$\sim p$ — by argument (2)

$\therefore r \wedge \sim s$ — by Modus ponens

4) $r \wedge \sim s$ — by Argument (3)

$\therefore \sim s$ — by Specialization

5) $\sim t \vee s$ — by Premise(b) Equivalence using "$p \rightarrow q \equiv \sim p \vee q$"

$\sim s$ — by Argument (4)

$\therefore \sim t$ — by ELIMINATION