CS441 – Discrete Structures for Computer Science
Instructor: Dr.Litman

Problems from Section 1.2

10. (b)

p	q	r	$(p \to q) \wedge (q \to r)$	$q \to r$	$[(p \to q) \wedge (q \to r)] \to (p \to r)$
T	T	T	T	T	T
T	T	F	F	F	T
T	F	T	F	T	T
T	F	F	F	T	T
F	T	T	T	T	T
F	T	F	F	F	T
F	F	T	T	T	T
F	F	F	T	T	T

For part (c) we have the following table.

p	q	$p \to q$	$p \wedge (p \to q)$	$[p \wedge (p \to q)] \to q$
T	T	T	T	T
T	F	F	F	T
F	T	T	F	T
F	F	T	F	T

For part (d) we have the following table. We have omitted some of the intermediate steps to make the table fit.

p	q	r	$(p \vee q) \wedge (p \to r) \wedge (q \to r)$	$[(p \vee q) \wedge (p \to r) \wedge (q \to r)] \to r$
T	T	T	T	T
T	T	F	F	T
T	F	T	T	T
T	F	F	F	T
F	T	T	T	T
F	T	F	F	T
F	F	T	F	T
F	F	F	F	T

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a)

$[(\neg p \wedge (p \vee q)] \to q$

$\equiv \neg [(\neg p \wedge (p \vee q)] \vee q$	$(x \to y \equiv \neg x \vee y$, Table 7)
$\equiv [(p \vee \neg(p \vee q)] \vee q$	(DeMorgan;s law)
$\equiv [(p \vee (\neg p \wedge \neg q)] \vee q$	(DeMorgan;s law)
$\equiv [(p \vee \neg p) \wedge (p \vee \neg q)] \vee q$	(Dist. Law)
$\equiv [T \wedge (p \vee \neg q)] \vee q$	(Negation Law)
$\equiv [(p \vee \neg q) \wedge T] \vee q$	(Commutative Law)
$\equiv [p \vee \neg q] \vee q$	(Identity Law)
$\equiv p \vee (\neg q \vee q)$	(Associative Law)
$\equiv p \vee T$	(Commutative and Negation Laws)
$\equiv T$	(Domination Laws)