Exercises 1

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September 6, 2019

1.1

It is a true proposition.

It is a false proposition.

It is a true proposition.

It is a false proposition.

It is not a proposition.

It is not a proposition.

1.15

- a) $p \rightarrow \neg q$ 4 rows.
- b) $(p \vee \neg r) \wedge (q \vee \neg s)$ 16 rows.
- c) $q \lor p \lor \neg s \lor r \lor \neg t \lor u$ 64 rows.
- d) $(p \wedge r \wedge t) \leftrightarrow (q \wedge t)$ 16 rows.

1.17

(a)
$$(p \lor q) \to (p \oplus q)$$

$$\boxed{p \mid q \mid p \lor q \mid p \oplus q \mid (p \lor q) \to (p \oplus q)}$$

2.5

	(a) $(p \wedge q) \to p$					$(b) p \to (p \lor q)$						
	p	q	$p \wedge q$	$(p \land q) \to p$				p	q	$p \lor q$	$p \to (p \lor q)$	
	F	F	F	T				F	F	F	T	
	F	T	F	T				F	T	T	T	
	T	F	F	T				T	F	T	T	
	T	T	T	T				T	T	T	T	
	(c) ¬ ₁	$\rho \rightarrow$	$(p \rightarrow q)$						(d)	$(p \wedge q)$	$\rightarrow (p \rightarrow q)$	
$p \mid q$	$p \to q$		$ \neg p \rightarrow$	$\neg p \to (p \to q)$		p	q	$p \land q \mid p \rightarrow$		$p \rightarrow \epsilon$	$(p \land q) \to (p \to q)$	
$F \mid F$	T		T			F	F	F		T	T	
$F \mid T$	T		T			F	T	I	7	T	T	
$T \mid F$	F		T			T	F	I	7	F	T	
$T \mid T$	1	7		T		T	T	7	7	T	T	
		(e)	$\neg (p \rightarrow$	$q) \rightarrow p$	_				(f)	$\neg(p \rightarrow$	$(q) \rightarrow \neg q$	
	$p \mid q$	1 1	$p \to q$	$\neg(p \to q) \to p$			p	q	p	$\rightarrow q$	$\neg(p \to q) \to \neg$	q
	$F \mid F$	7	T	T			F	$\mid F \mid$		$T \mid$	T	
	$F \mid T$	7	T	T			F	$\mid T$		T	T	
	$\Gamma \mid F$	7	F	T			T	F		F	T	
-	$\Gamma \mid T$	7	T	T			T	T		T	T	

2.11

$\neg(p \leftrightarrow q)$	$p \leftrightarrow q$	p	q	$\neg p$	$\neg p \leftrightarrow q$
F	T	F	F	T	F
T	F	F	T	T	T
T	F	T	F	F	T
F	T	T	T	F	F

2.15

p	q	r	$(p \to q)$	$(q \rightarrow r)$	$(p \to r)$	$(p \to q) \land (q \to r) \to (p \to r)$
F	F	F	T	T	T	T
F	F	T	T	T	T	T
F	T	F	T	F	T	T
F	T	T	T	T	T	T
T	F	F	F	T	F	T
T	F	T	F	T	T	T
T	T	F	T	F	F	T
T	T	T	T	T	T	T