Epp 2nd Ed. 1.1 5abcd, 7, 8, 13, 15, 18, 20, 39, 40, 42

(5) Indicate which of the following sentences are statements. If it's not a statement, say why.

(a) 1024 is the smallest 4-digit number that is a perfect square.

(b) She is a math major. No. who's she?

(c) $128 = 2^6$ Yes. -

(d) $x=2^6$ No. what's x?

For problems 7 and 8, write the statement in symbolic form using the symbols \sim , \wedge , and \vee and the indicated letter to represent component statements:

(7) Juan is a math major but not a computer science major. (m = "Juan is a math major", c = "Juan is a computer science major")

m / ~ c/

(8) h = "John is healthy", w = "John is wealthy", s = "John is wise"

(a) John is healthy and wealthy but not wise.

(h/w)/~s h/w/~s/

(b) John is not wealthy but he is healthy and wise.

~w/h/s/ of ~w/ (h/s)

(c) John is neither healthy, wealthy, nor wise.

~ h / ~ w / ~ s) - or ~ (h/w/s)

Write truth tables for the statement forms in problems 13 and 15:

(13) $(p \wedge a) \vee \sim (p \vee a)$

(/	(1-	-17 . (1-		37		
р	q	P191	1 P V91	1~(pV4)	(PNq) V~(PVq))
T	Т	T	T	F	T	,
Т	F	F	T /	F	F	
F	T	F	T	F	F	
F	F	F	F	1 - 11	T	

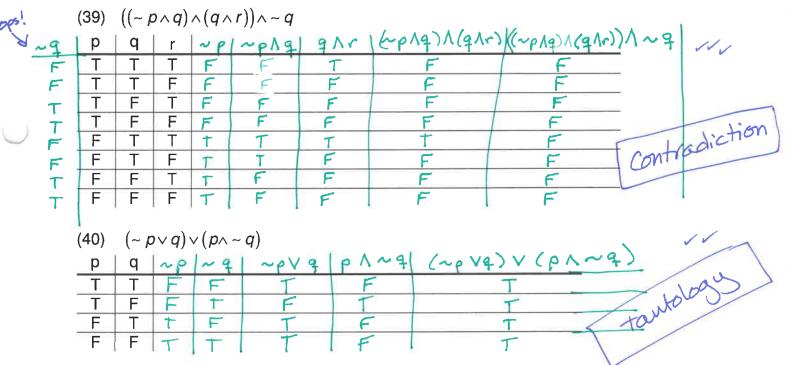
 $(15) \sim p \wedge (q \vee \sim r)$

` '	•	٠.	,				
р	q	r	~P	~~	a Var	~PN(qV~r)	
Т	T	T	F	F	T	F	
Т	Т	F	F	T	T	F	
Т	F	Т	F	F	F	F	
	F	F	F	T	T	F	
F	T	T	T	F	T	T	
F	Т	F	T	T	T	T	/
F	F	Т	T	F	F	F	
F	F	F	T	T	T	T	

Determine which of the pairs of statement forms in 18 and 20 are logically equivalent. Justify your answers using truth tables. Read t to be a tautology and c to be a contradiction.

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(18) $\sim (p \vee q)$ and $\sim p \wedge \sim q$											
р	q	PVq	1~ (p Vq)		р	q	12p	1~9	12pla	9	
Т	T	τ .	F		T	Т	F	F	F		
T	F	T	F	/	Т	F	F	T	F		
F	Т	T	F		F	Т	T	F	F		
F	F	F	T	0	F	F	T	T	T		
1 Theire the same!											
(20) p∨c and p											
р	С	PVC									
T	F	T									
F	F	F			1						
They're the same!											
		1									

Use truth tables to establish which of the statements forms in problems 39 and 40 are tautologies and which are contradictions:



In problem 42, a logical equivalence is derived from Theorem 1.1.1. Supply a reason for each step: (42)

$$(p \lor \neg q) \land (\neg p \lor \neg q)$$

$$\equiv (\neg q \lor p) \land (\neg q \lor \neg p) \text{ by } (1) \text{ commutativity}$$

$$\equiv \neg q \lor (p \land \neg p) \text{ by } (3) \text{ distributitive laws}$$

$$\equiv \neg q \lor c \text{ by } (5) \text{ negation bass}$$

$$\equiv \neg q \text{ by } (4) \text{ identity laws}$$

Therefore, $(p \lor \sim q) \land (\sim p \lor \sim q) \equiv \sim q$.