Logic – Truth Tables

Construct a truth table for each of the following.

1. $\sim p \vee \sim q$

p	q	$\sim p$	$\sim q$	$\sim p \vee \sim q$
T	T	F	F	F
T	F	F	T	T
F	T	T	F	T
F	F	T	T	T

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2. $P \vee (\sim Q \wedge R)$

P	Q	R	$\sim Q$	$\sim Q \wedge R$	$P \vee (\sim Q \wedge R)$
T	T	T	F	F	T
T	T	F	F	F	T
T	F	T	T	T	T
T	F	F	T	F	T
F	T	T	F	F	F
F	T	F	F	F	F
F	F	T	T	T	T
F	F	F	T	F	F

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3. $p \wedge (\sim q \vee r)$

p	q	r	$\sim q$	$\sim q \vee r$	$p \wedge (\sim q \vee r)$
T	T	T	F	T	T
T	T	F	F	F	F
T	F	T	T	T	T
T	F	F	T	T	T
F	T	T	F	T	F
F	T	F	F	F	F
F	F	T	T	T	F
F	F	F	T	T	F

4. $(P \wedge Q) \vee (R \wedge S)$

P	Q	R	S	$P \wedge Q$	$R \wedge S$	$(P \wedge Q) \vee (R \wedge S)$
T	T	T	T	T	T	T
T	T	T	F	T	F	T
T	T	F	T	T	F	T
T	T	F	F	T	F	T
T	F	T	T	F	T	T
T	F	T	F	F	F	F
T	F	F	T	F	F	F
T	F	F	F	F	F	F
F	T	T	T	F	T	T
F	T	T	F	F	F	F
F	T	F	T	F	F	F
F	T	F	F	F	F	F
F	F	T	T	F	T	T
F	F	T	F	F	F	F
F	F	F	T	F	F	F
F	F	F	F	F	F	F

Use a truth table to determine if each set of conditions are logically equivalent.

5. $P \vee Q$ and $\sim(\sim P \wedge \sim Q)$

P	Q	$P \vee Q$	$\sim P$	$\sim Q$	$\sim P \wedge \sim Q$	$\sim(\sim P \wedge \sim Q)$
T	T	T	F	F	F	T
T	F	T	F	T	F	T
F	T	T	T	F	F	T
F	F	F	T	T	T	F

Since the two columns are the same, the two statements are logically equivalent.

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6. $p \wedge (r \wedge q)$ and $\sim p \vee (\sim r \vee \sim q)$

p	q	r	$r \wedge q$	$p \wedge (r \wedge q)$	$\sim p$	$\sim q$	$\sim r$	$\sim r \vee \sim q$	$\sim p \vee (\sim r \vee \sim q)$
T	T	T	T	T	F	F	F	F	F
T	T	F	F	F	F	F	T	T	T
T	F	T	F	F	F	T	F	T	T
T	F	F	F	F	F	T	T	T	T
F	T	T	T	F	T	F	F	F	T
F	T	F	F	F	T	F	T	T	T
F	F	T	F	F	T	T	F	T	T
F	F	F	F	F	T	T	T	T	T

Since the two columns are not the same, the two statements are not logically equivalent.

