CISC 2210 Discrete Structures - Noson S. Yanofsky

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2.2

1.

Give the converse and contrapositive for each of the following propositions:

(a)

$$p \to (q \wedge r)$$

converse: $(q \wedge r) \to p$
contrapositive: $\neg(q \wedge r) \to \neg p$

(b)

$$\text{if } x + y = 1, \text{ then } x^2 + y^2 \geq 1$$

converse: if $x^2 + y^2 \geq 1$, then $x + y = 1$
contrapositive: if $x^2 + y^2 \ngeq 1$, then $x + y \neq 1$

(c)

$$\text{if } 2 + 2 = 4, \text{ then } 3 + 3 = 8$$

converse: $if 3 + 3 = 8, then 2 + 2 = 4$
contrapositive: $if 3 + 3 \neq 8, then 2 + 2 \neq 4$

3.

Consider the following propositions:

(a)

Which proposition is the converse of $p \to q$?

$$q \to p$$

(b)

Which proposition is the contrapositive of $p \to q$?

$$\neg q \to \neg p$$

(c)

Which propositions are logically equivalent to $p \to q$?

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

9.

Construct the truth table for $[(p \vee q) \wedge r] \to (p \wedge \neg q)$

p	q	r	$[(p \vee q)$	$\wedge r]$	$\to$	$(p \wedge$	$\neg q)$
0	0	0	0	0	**1**	0	1
0	0	1	0	0	**1**	0	1
0	1	0	1	0	**1**	0	0
0	1	1	1	1	**0**	0	0
1	0	0	1	0	**1**	1	1
1	0	1	1	1	**1**	1	1
1	1	0	1	0	**1**	0	0
1	1	1	1	1	**0**	0	0

11.

Construct truth tables for:

(a)

$$\neg(p \vee q) \to r$$

p	q	r	$\neg$	$(p \vee q)$	$\to r$
0	0	0	1	0	**0**
0	0	1	1	0	**1**
0	1	0	0	1	**1**
0	1	1	0	1	**1**
1	0	0	0	1	**1**
1	0	1	0	1	**1**
1	1	0	0	1	**1**
1	1	1	0	1	**1**

12.

(a)

(b)

(c)

(d)

(e)

(f)

(g)

(h)