Derek Haynes Bridge to Abstract Math HW 1.

Section 1.1 ¶

3.

Make a truth table for each of the following propositional forms:

(h) $\sim P \wedge \sim Q$

Solution:

p	q	$\sim p$	$\sim q$	$\sim p \wedge \sim q$
T	T	F	F	F
T	F	F	T	F
F	T	T	F	F
F	F	T	T	T

(k) $P \wedge P$

Solution:

p	p	$p \wedge p$
T	T	T
F	F	F

6.

Which pair of propositional forms are equivalent?

(a) $\sim (P \wedge Q), \sim P \wedge \sim Q$

Solution:

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

p	q	$\sim p$	$\sim q$	$\sim p \wedge \sim q$
T	T	F	F	F
T	F	F	T	F
F	T	T	F	F
F	F	T	T	T

From the truth tables Rows 2 and 3 are not the same (this is an example of de morgan's law)

11.

Give a use denial of each statement. Assume that each variable is some fixed object so that each statement is a proposition.

(b) Cleveland will win the first game or the second game.

P = Cleveland will win the first game

Q = Cleveland will win the second game

so this statement is $P \vee Q$

The denial would be cleveland did will not win the first or second game

$\sim (P \vee Q)$

12.

Restore parenthesis to these abbreviated propositional form

(b) $Q \wedge \sim S \vee \sim (\sim P \wedge Q)$

Solution:

step 1. $Q \wedge (\sim S) \vee \sim ((\sim P) \wedge Q)$

step 2. $Q \wedge (\sim S) \vee (\sim ((\sim P) \wedge Q))$

step 3. $(Q \wedge (\sim S)) \vee (\sim ((\sim P) \wedge Q))$

Section 1.2

1.

(b) If the moon is made of chese then 8 is an irrational number

The Antecedent is "The moon is made of cheese" and the Consequent is "8 is an irrational number"

5.

Which of the following conditional sentence are true? Give reason.

(f) If Euclid's birthday was April 2, then rectangles have four sides.

p	q	$p \Rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T

In line 3 the consequent is true... therefore the expression is true

6.

Which of the following are true?

(f) $\sqrt{10} + \sqrt{13} < \sqrt{11} + \sqrt{12} \iff \sqrt{13} - \sqrt{12} < \sqrt{11} - \sqrt{10}$

Solution:

p	q	$p \iff q$
T	T	T

Since the statements P and Q are true the biconditional statement is also true.

(g) $x^2 \geq 0 \; if \; and \; only \; if \; x \geq 0$

p	q	$p \iff q$
T	F	F

The biconditional statement can be False - the first proposition can have x less that 0 and the statement would be True , while the second propsition can be false, leaving the bicondtional statement false.

8.

Prove Theorem 1.2.2 by constructing truth tables for each of the following equivalence:

(d) $\sim (P \wedge Q) \; and \; P \Rightarrow \sim Q$

Solution:

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

p	q	$\sim q$	$p \Rightarrow \sim q$
T	T	F	F
T	F	T	T
F	T	F	T
F	F	T	T

The fourth columns are identical and prove that the statements are equivalent.

14.

Give, if possible, an example of a false conditional sentence for which

(b) the converse is false

Solution:

If it snows greater than 10 inches tonight, school will close tomorrow

`The false converse`

If school closes tomorrow, it was because it snowed greater than 10 inches.

(d) the contrapositive is true.

Solution:

If it rains greater than 2 inchese, they will cancel the game today.

`The true contrapositive`

If they don't cancel the game today, it didnt rain greater than 2 inches.

In [ ]: