

Name: Solution

Student Number: _____

Mark: _____/10

MAE 106: QUIZ 2

INSTRUCTIONS:

- (1) You have 15 minutes to complete this quiz.
- (2) You may not consult your neighbour, look at any notes, or the textbook.
- (3) Answers written in pencil will not qualify for remarking.

QUESTIONS:

- (1) Prove, using a truth table, that $\neg(\neg p \vee q) \Leftrightarrow (p \wedge \neg q)$. (4 marks)

p	q	$\neg p$	$\neg p \vee q$	$\neg(\neg p \vee q)$	$\neg q$	$p \wedge \neg q$
T	T	F	T	F	F	F
T	F	F	F	T	T	T
F	T	T	T	F	F	F
F	F	T	T	F	T	F

- (2) For $p \rightarrow q$, state the
 - (a) inverse: $\neg p \rightarrow \neg q$
 - (b) converse: $q \rightarrow p$
 - (c) contrapositive: $\neg q \rightarrow \neg p$
- (3) Using the rules of inference, prove that $(p \wedge q) \rightarrow p \Leftrightarrow \top$. (4 marks)

The truth values are the same.
 \therefore they are logically equivalent.

$$\begin{aligned}
 (p \wedge q) \rightarrow p &\Leftrightarrow \neg(p \wedge q) \vee p && \text{Implication} \\
 &\Leftrightarrow (\neg p \vee \neg q) \vee p && \text{De Morgan} \\
 &\Leftrightarrow (\neg q \vee \neg p) \vee p && \text{Comm.} \\
 &\Leftrightarrow \neg q \vee (\neg p \vee p) && \text{Assoc.} \\
 &\Leftrightarrow \neg q \vee \top && \text{Excluded Middle.} \\
 &\Leftrightarrow \top && \text{Domination.}
 \end{aligned}$$

