Name: _____ ID#:_____

Math 15A - Discrete Mathematics - Spring 1999

Answers for Quiz #1 — April 7

You may NOT use the textbook, notes or other references for this test. The test continues on the reverse side of the paper.

1. (15 pts) Write a complete truth table for the two formulas $p \to (\sim q \wedge p)$ and $p \leftrightarrow (\sim q \wedge p)$. (A single six-column truth table will suffice.)

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

Is either formula a tautology? — NO.

Are the formulas equivalent? — YES. (SINCE LAST TWO COLUMNS ARE THE SAME.)

2. (9 pts) Indicate for each sentence, whether it is true or false: (write 'T' or 'F' on the line)

__T__(a) Birds have wings if cats have wings.

__T__(b) Cats can fly only if dogs have wings.

__T__(c) Horses can fly only if birds have wings.

MORE PROBLEMS ON BACK...

For the next two problems, use the following sentence symbols: d = "The dollar is strong"; s = "The stock market is high"; and w = "The war is going well".

3. (15pts) Express the following English sentences as implications (use formal symbols, such as $s \to w$):

$d \to s$ (a) If the dollar is strong, then stock market is high.

$s \to w$ (b) For the stock market to be high, it is necessary that the war be going well.

$d \to s$ (c) A strong dollar is a sufficient condition for the stock market to be high.

$w \to d$ (d) The dollar is strong if the war is going well.

$s \to w$ (e) The stock market is high only if the war is going well.

4. (6 pts) Express the following formula in symbols. You may use s, w and connectives chosen from $\wedge$, $\vee$, $\sim$, $\to$, $\leftrightarrow$, but do not use $\oplus$.

Either the stock market is strong or the war is going well, but not both.

$(s \vee w) \wedge \sim(s \wedge w)$.

ALTERNATES: $(s \vee w) \wedge (\sim s \vee \sim w)$; OR: $(s \wedge \sim w) \vee (\sim s \wedge w)$.

5. (15pts) For each formula in the left column, find a logically equivalent formula in the right column.

d	$p \wedge \sim p$	**a.** p
c	$p \vee \sim p$	**b.** $\sim p$
b	$p \to \sim p$	**c.** $p \to p$
e	$\sim q \to \sim p$	**d.** $q \wedge \sim q$
f	$\sim(p \to q)$	**e.** $\sim p \vee q$
		f. $p \wedge \sim q$
		g. None of the above.