HOMEWORK ASSIGNMENT # 1

MATH 251, FALL 2006, WILLIAMS COLLEGE

ABSTRACT. This assignment has 5 problems on 2 pages. It is due on Thursday, September 14 in class. Talk with me if you have difficulty. Good luck!

1. Problem One

Construct the truth table of $q \longleftrightarrow ((\neg p) \vee (\neg q))$.

2. Problem Two

Suppose that p and r are false statements and that q and s are true statements. Find the truth values of the following statements.

(1) $(p \longrightarrow q) \longrightarrow r$
(2) $(s \longrightarrow (p \wedge (\neg r))) \wedge ((p \longrightarrow (r \vee q)) \wedge s)$

3. Problem Three

Consider the statement $\mathcal{A}$: "If n is an integer, then $\dfrac{n}{n+1}$ is not an integer."

(1) Is $\mathcal{A}$ true or false? Either prove it is true, or give a counter-example.
(2) Write the converse, contrapositive and negation of $\mathcal{A}$.

4. Problem Four

Given the premises $p \longrightarrow (\neg r)$ and $r \vee q$, write down a valid conclusion that involves p and q only and is not a tautology, or show that no such conclusion is possible.

Date: September 7, 2006.

5. Problem Five

Decide if the following arguments are valid.

(1)
If I stay up late at night, then I will be tired in the morning.
I stayed up late last night.

I am tired this morning.

(2)
If I stay up late at night, then I will be tired in the morning.
I am not tired this morning.

I stayed up late last night.

(3)
If I stay up late at night, then I will be tired in the morning.
I am not tired this morning.

I did not stay up late last night.

(4)
If I stay up late at night, then I will be tired in the morning.
I did not stay up late last night.

I am not tired this morning.

(5)
If I like mathematics, then I will study.
I will not study.
Either I like mathematics or I like football.

I like football.

(6)
Either I study or I like football.
If I like football, then I like mathematics.

If I don't study, then I like mathematics.