

Remember that your work is graded on the quality of your writing and explanation as well as the validity of the mathematics. (5 Points) For this week, less writing is required than on future quizzes, but make sure what you do write is legible and well organized.

- (1) (9 Points) Use a truth table to verify the following tautology:  $[\neg(p \Rightarrow q)] \Leftrightarrow [p \wedge (\neg q)]$ . Make sure to explain why your table proves the desired result.

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

The truth table shows that for all values of  $p$  &  $q$ , the statements  $\neg(p \Rightarrow q)$  and  $(p \wedge (\neg q))$  have the same truth value. Thus,  

$$\neg(p \Rightarrow q) \Leftrightarrow (p \wedge (\neg q))$$

- (2) (6 Points) Negate the following statements. You should not just put the negation symbol in front of the statement; rather, change logical operators, words and symbols as needed to express the negation as a new, well-written statement.

Five is prime or six is odd.

Five is composite and six is even.  
 (not prime) (not odd)

The functions  $f$  and  $g$  are differentiable.

The function  $f$  is not differentiable or the function  $g$  is not differentiable.

If  $x > 0$ , then  $f'(x) \neq 0$ .

$x > 0$  and  $f'(x) = 0$ .