Math 174, Fall 1998, Exam 2

PRINT Your Name:__________________________________________

There are 10 problems on 4 pages. Each problem is worth 10 points.  
[CIRCLE] your answers.  No Calculators.

1. True or False. If true, prove it. If false, then give a counterexample.  A necessary condition for an integer to be divisible by 6 is that it be divisible by 2.

2. True or False. If true, prove it. If false, then give a counterexample. The sum of any two irrational numbers is irrational.

3. True or False. If true, prove it. If false, then give a counterexample. For all integers a, b, and c, if a|bc, then a|b or a|c.

4. Write 58 in base 16.

5. What is the negation of “x < 3 or 7 ≤ x”? 

6. Is the following argument valid?  
   For all students x, if x studies discrete mathematics, then x is good at logic.  
   Ken does not study discrete mathematics.  
   ∴ Ken is not good at logic.

7. True or False. If true, prove it. If false, then give a counterexample. If $p_1, p_2, p_3, \ldots, p_r$ are prime integers, then $N = p_1 p_2 p_3 \cdots p_r + 1$ is a prime integer.

8. True or False. If true, prove it. If false, then give a counterexample. The number $\sqrt{3}$ is irrational.

9. Find an explicit formula for the sequence whose first few terms are $a_1 = \frac{1}{2}$, $a_2 = -\frac{2}{3}$, $a_3 = \frac{3}{4}$, $a_4 = -\frac{4}{5}$, $a_5 = \frac{5}{6}$, $a_6 = -\frac{6}{7}$.

10. True or False. If true, prove it. If false, then give a counterexample. If n is an integer with $n \mod 3 = 1$, then $\lceil n/3 \rceil = (n - 1)/3$.  