

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  $7 \leq x$ "?
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.  
 $\therefore$  Ken is not good at logic.
7. True or False. If true, **prove** it. If false, then give a **counterexample**. If  $p_1, p_2, p_3, \dots, p_r$  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  $n \bmod 3 = 1$ , then  $\lfloor n/3 \rfloor = (n-1)/3$ .