

## Test One Review

1. Give a truth table for  $[\sim (\sim p \vee q)] \wedge (p \vee r)$ . Include enough intermediate columns so that I can tell that you know what you are doing.
2. Let  $S = \{x \in \mathbb{R} | x^2 < x\}$  and let  $T = \{x \in \mathbb{R} | 0 < x < 1\}$ . Prove that  $S = T$ .
3. Prove that for any two sets  $A$  and  $B$ ,

$$(A \setminus B) \cup (B \setminus A) = (A \cup B) \setminus (A \cap B).$$

4. Negate the following statements:
  - (a) Every prime number is odd.
  - (b) There is a natural number  $n$  such that  $n(n+1) = n$  or  $n(n+1) = n+1$ .
  - (c)  $|x| = x$  or  $|x| = -x$ .
  - (d) If  $n$  is even and if  $5|n$  then the last digit of  $n$  is zero.
5. Prove that if  $x$  is even and  $y$  is even then  $xy$  is divisible by 4.
6. Let  $a$ ,  $b$ , and  $c$  be positive integers. Prove by contradiction that if  $a \nmid b$  then  $ac \nmid bc$ .
7. For natural numbers  $m$  and  $n$ , prove that if  $mn \neq 1$  then  $m \neq 1$  and  $n \neq 1$ . (Prove this by contrapositive).
8. Consider the statement "If  $a < 0$  and  $b > 0$  then  $ab < 0$ ."
  - (a) Write the converse of the statement.
  - (b) Write the contrapositive of the statement.
  - (c) Write the inverse of the statement.
  - (d) Write the negation of the statement.