Math 174, Fall 1998, Exam 1

PRINT Your Name:_____

There are 10 problems on 4 pages. Each problem is worth 10 points.

$\boxed{CIRCLE}$ your answers.

1. Are $p \wedge (q \vee r)$ and $(p \wedge q) \vee r$ logically equivalent? Justify your answer.

2. What is negation of $2 \leq x < 3$?

3. Write $(p \wedge \sim q) \rightarrow r$ using $\wedge$, $\vee$, and $\sim$, but not $\rightarrow$.

4. Write the following sentence in if – then form: "A necessary condition for this computer program to be correct is that it not produce error messages during translation."

5.
   (a) Write 45 in base 2.
   (b) Write 45 in base 16.

6. Are $p \wedge (q \vee r)$ and $(p \wedge q) \vee (p \wedge r)$ logically equivalent? Justify your answer.

7. Consider the statement "if $3 < x$, then $9 < x^2$".
   (a) What is the converse of the original statement?
   (b) Is (a) logically equivalent to the original statement?
   (c) What is the contrapositive of the original statement?
   (d) Is (c) logically equivalent to the original statement?

8. Is the following argument valid?
   For all students x, if x studies discrete mathematics, then x is good at logic.
   Jill is not good at logic.
   $\therefore$ Jill does not study discrete mathematics.

9. Consider the following statement:

   $\forall$ basketball players x, x is tall.

   Which of the following are equivalent ways of expressing this statement?
   (a) Every basketball player is tall.
   (b) Among all the basketball players, some are tall.
   (c) Some of all the tall people are basketball players.
   (d) Anyone who is tall is a basketball player.
   (e) All people who are basketball players are tall.
   (f) Anyone who is a basketball player is a tall person.

10. Is the following argument valid?
    For all students x, if x studies discrete mathematics, then x is good at logic.
    Henry is good at logic.
    $\therefore$ Henry studies discrete mathematics.