Plagiarism will earn you an F in the course and a recommendation of expulsion from the university.

1. $\mathrm{T} \wedge \mathrm{F} =$
    a. T
    b. F
2. $\mathrm{T} \vee \mathrm{F} =$
    c. F
    d. T
3. Which of the following are predicates? Choose all that are correct.
    a. *x* is odd.
    b. 22 is a prime number.
    c. $\frac{1}{1+x} < 1.$
    d. $16 = x^2.$
    e. There are 15 questions on this exam.
4. $\neg p \vee \neg q \equiv \neg(p \wedge q)$
    a. True
    b. False
5. $p \wedge q \equiv \neg(p \wedge \neg q)$
    c. True
    d. False
6. *A*={1,5,2,3}, *B*={1,2,5,3}
    a. *A*=*B*
    b. *A*≠*B*
7. *A*={1,2,3,4}, *B*={1,2,3,4,5}. Choose all that are correct.
    a. $A \subset B$
    b. $B \subset A$
    c. $A \subseteq B$
    d. $B \subseteq A$
    e. $A \nsubseteq B$
8. *A*={1,2,3,4,5,6}, *B*={1,2,3,4,5}. Choose all that are correct.
    a. $A \subset B$
    b. $B \subset A$
    c. $A \subseteq B$
    d. $B \subseteq A$
    e. $A \nsubseteq B$

9. *A*={1,2,3,4}, *B*={1,2,3,4,5}. Choose all that are correct.
    a. $A \cap B = \{2\}$
    b. $A \cap B = \{2,3\}$
    c. $A \cap B = \{1,2,3,4,5\}$
    d. $A \cap B = \{5\}$
    e. $A \cap B = \{1,2,3,4\}$
10. *A*={1,2,3,4}, *B*={1,2,3,4,5}. Choose all that are correct.
    a. $A \cup B = \{2\}$
    b. $A \cup B = \{2,3\}$
    c. $A \cup B = \{1,2,3,4,5\}$
    d. $A \cup B = \{5\}$
    e. $A \cup B = \{1,2,3,4\}$
11. Let $c(x) = x^3$, where *x* is a real value. Choose all that are correct.
    a. *c* is neither one-to-one nor onto.
    b. *c* is one-to-one but not onto.
    c. *c* is onto but not one-to-one.
    d. *c* is both one-to-one and onto.
12. Choose all that are correct.
    a. $\lfloor 10.9 \rfloor = 10$
    b. $\lceil 10.9 \rceil = 10$
    c. $\lfloor 10.1 \rfloor = 10$
    d. $\lceil 9.9 \rceil = 10$
    e. $\lceil 9.1 \rceil = 10$
13. $(A \cup B) \cup C = A \cup (B \cup C)$ is an example of which law.
    a. De Morgan's Law
    b. Law of Diminishing Returns
    c. Associative Law
    d. Commutative Law
    e. Murphy's Law
14. $\sum_{i=1}^{n} i =$
    a. n^2
    b. $\frac{n(n+1)}{2}$
    c. $\frac{(n-1)(n+1)}{2}$
    d. n^3
    e. Θ(*n*)

15. Let $X = \{u, v, w, y\}$. Define a function $g: X \to X$ to be $g = \{(u, v), (v, w), (w, y), (y, u)\}$. What is $g^{-1}(x)$? Choose all that apply.
    a. {(*u*,*w*)}
    b. {(*y*,*u*),(*w*,*y*),(*v*,*w*),(*u*,*v*)}
    c. {(*w*,*u*)}
    d. {(*v*,*u*),(*w*,*v*),(*y*,*u*),(*w*,*y*)}
    e. None of the above
16. $\sum_{j=0}^{n} 2^j =$
    a. $2^j + \sum_{j=0}^{n-1} 2^j$
    b. $2^{n-1} + \sum_{j=0}^{n-1} 2^j$
    c. $2^n + \sum_{j=0}^{n-1} 2^j$
    d. $2^n + \sum_{j=0}^{n} 2^j$
    e. $\sum_{j=0}^{n/4} 4^j$
17. Given an ordered array of *n* items on a sequential computer (*i.e.*, a RAM), what is the worst-case (*i.e.*, longest) running time of Binary Search?
    a. Θ(*n* log *n*)
    b. Θ(*n*)
    c. Θ(log *n*)
    d. Θ(n^2)
18. Given a list of *n* items, arbitrarily ordered on a sequential computer. Choose all that correctly describe the running time of (an efficient implementation of) MergeSort.
    a. Θ(*n* log *n*)
    b. Ω(*n*)
    c. Θ(log *n*)
    d. *O*(n^2)
    e. MergeSort has the same behavior, in terms of running time, as QuickSort.
19. Given a PRAM with *n* processors and *n* data initially distributed arbitrarily in the first *n* locations of the shared memory, the minimum value of these n items can be determined by using which technique.
    a. Massively Exploding
    b. Massively Imploding
    c. Recursive Doubling
    d. Recursive Halving
20. Suppose you are given a linear array of size *n* with *n* pieces of data initially distributed one per processor in an arbitrary fashion. Choose all that apply.
    a. The minimum value requires Ω(*n*) time to be determined.
    b. The minimum value can be determined in Θ(log *n*) time.
    c. The minimum value can be determine in Θ(*n*) time, which is asymptotically optimal for this architecture.
    d. The minimum value is 1.
    e. None of the above.

Extra Credit

21. Dr. Miller is a member of which Pop/Rock Band?
    a. The False Implications
    b. Florence and the Fender Precisions
    c. Theorem and Lemmas
    d. Escher's Enigma
    e. Prof. Miller is not in a Pop/Rock Band.
22. What is the name of the software created by Dr. Miller's research group in molecular structure determination?
    f. Prestige-Worldwide
    g. Snoop-a-Loop
    h. Shake-and-Bake
    i. All-Along-The-Watchtower
    j. None of the above. These are all phrases used by Will Farrell and have nothing to do with Dr. Miller's research.