FINITE MATH LOGIC EXAM A NAME _____

SHOW ALL WORK ON THIS TEST OR SEPARATE PAPER. Justify all answers.

In 1 - 2 state DeMorgan's Laws:

1. 2.

In 3 - 6, give negations for each of the following statements:

3. All teachers are dull.

4. Some people are lucky.

5. No students are happy.

6. If it rains, then we get wet.

7. Express the disjunction as an implication:
"You must stop smoking, or your health will suffer."

8. Express the implication as a disjunction:
"If you pass this test, then you will be happy."

In 9 - 18, given: "If you pass this test, then you will be happy."

9. Contrapositive:

10. Converse:

11. Inverse:

12. Negation:

13. Which of the above is (are) equivalent to the original statement?

14. Give the necessary condition:

15. Give the sufficient condition:

16. Is "passing the test" necessary "to be happy"?

17. Is "being happy" necessary to "passing the test"?

18. Write the statement using "only if."

19. Given: "I will go to the store if we need milk."
Give the contrapositive.

20. If Joe is happy, then he is in love. Joe is not happy.
Therefore, _____

In 21-28, use logical principles (name the principle!) or Euler circles to determine if the arguments are valid or invalid. Show or explain each answer.

21. If you like logic, then you must be crazy. Joe must be crazy. Therefore, he likes logic.

22. If you pass the test, then you will be admitted to the University. You did not pass the test. Thus, you will not be admitted.

23. I will study this test or I will make an A. I did not study. Therefore, I will make an A.

24. If it's a Sony, it must be good. It's not a Sony, so it is probably not any good.

25. Jill feels well today. I know this because if she works out, then she feels well, and Jill worked out today.

26. All birds have wings. All buzzards are birds. Therefore, all buzzards have wings.

27. All logic problems make sense. Some jokes make sense. Thus, some logic problems are jokes.

28. Some immoral acts are justifiable. This is true because all thefts are immoral acts and some thefts are justifiable.

In 29-40, select the correct answer (MULTIPLE CHOICE):

29. Select the statement that is the negation of the statement "I am not hungry and I am thirsty."
    A. I am hungry or I am not thirsty.
    B. I am hungry and I am not thirsty.
    C. If I am not hungry, then I am thirsty.
    D. If I am hungry, then I am thirsty.

30. Select the statement that is the negation of the statement "If it rains, we will not go to the store."
    A. If it doesn't rain, then we will go to the store.
    B. It is raining and we do not go to the store.
    C. If we go to the store, then it will not rain.
    D. It is raining and we will go to the store.

31. Select the statement below that is logically equivalent to "If Tom studies, then he will pass CLAST."
    A. If Tom does not study, then he will not pass CLAST.
    B. If Tom passed CLAST, then he studied.
    C. If Tom did not pass CLAST, then he did not study.
    D. Tom studies and does not pass CLAST.

32. Select the statement below that is logically equivalent to "It is not true that Jim is playing golf or Mary is playing tennis."
    A. Jim is not playing golf or Mary is not playing tennis.
    B. Jim is playing golf and Mary is not playing tennis.
    C. If Jim is not playing golf, then Mary is not playing tennis.
    D. Jim is not playing golf and Mary is not playing tennis.

33. Select the statement below that is logically equivalent to "If Jones is in Los Angeles, then he is in California."
    A. If Jones is not in California, then he is not in Los Angeles.
    B. Jones is in Los Angeles, or he is in California.
    C. If Jones is in California, then he is in Los Angeles.
    D. If Jones is not in Los Angeles, then he is not in California.

34. Given that: i. No people who assign work are lovable.
    ii. All supervisors assign work.
    determine which conclusion can be logically deduced.
    A. All supervisors are lovable.
    B. Some supervisors are lovable.
    C. No supervisors are lovable.
    D. None of the above is true.

35. Select the conclusion that will make the following argument valid. "If I pass the CLAST, then I will get my AA degree. If I get my AA degree, then I will attend the university."
    A. If I do not pass the CLAST, then I will not attend the university.
    B. If I get my AA degree, then I pass the CLAST.
    C. If I pass the CLAST, then I will attend the university.
    D. If I pass the CLAST, then I will not attend the university.

36. Select the conclusion that will make the following argument valid. "If the vaccine is effective, then I will not become ill. If I do not become ill, then I will not miss any days from work."
A. If the vaccine is not effective, then I will miss some days from work.
B. If the vaccine is effective, then I will not miss any days from work.
C. If I do not become ill, then the vaccine was effective.
D. If the vaccine is effective, then I will miss some days from work.

37. Select the rule of logical equivalence that directly (in one step) transforms statement "i" into statement "ii."

i. If Joe takes calculus, then he will buy a calculator.
ii. Joe will not take calculus or he will buy a calculator.

A. "If p, then q" is equivalent to "if not q, then not p."
B. "If p, then q" is equivalent to "(not p) or q."
C. "Not (p and q)" is equivalent to "(not p) or (not q)."
D. Correct equivalence rule is not given.

38. Select the rule of logical equivalence that directly (in one step) transforms statement "i" into statement "ii."

i. If x^2 is even, then x is even.
ii. If x is not even, then x^2 is not even.

A. "Not (p and q)" is equivalent to "(not p) or (not q).
B. "If p, then q" is equivalent to "if not q, then not p."
C. "If p, then q" is equivalent to "(not p) or q."
D. Correct equivalence rule is not given.

39. Study the information given below. If a logical conclusion is given, select that conclusion.

"If I pass this test, then I will graduate. I pass this test or I get a job. I did not get a job."
A. I did not pass this test.
B. I did not graduate.
C. I did graduate.
D. None of the above is warranted.

40. Study the information given below. If a logical conclusion is given, select that conclusion.

"Mary eats ice cream or she eats yogurt. If Mary eats yogurt, then she is healthy. If Mary is healthy, then she can run the marathon. Mary does not eat yogurt."

A. Mary does not eat ice cream.
B. Mary is healthy.
C. If Mary runs the marathon, then she eats yogurt.
D. None of the above is warranted.

FINITE MATH LOGIC EXAM A

DeMorgan's Laws
1. $\sim(p \vee q) = \sim p \wedge \sim q$.
2. $\sim(p \wedge q) = \sim p \vee \sim q$

3. Some teachers are not dull.
4. No people are lucky.
5. Some students are happy
6. It rains and we do not get wet.
7. $p \vee q = \sim p \rightarrow q$ or $\sim q \rightarrow p$
   If you do not stop smoking, then your health will suffer.
8. $p \rightarrow q = \sim p \vee q$
   You do not pass test, or be happy.
9. Contra: If not happy, then not pass
10. Converse: If happy, then pass test.
11. Inverse: If not pass test, then not happy.
12. Negation: You pass test and not happy.
13. Contrapositive (#9)
14. Necessary: Being happy
15. Sufficient: Passing test.
16. No 17. Yes.
18. You pass test, only if happy.
19. If I do not go to store, then we do not need milk.
20. No conclusion can be drawn.
21. Logic → crazy. (Fallacy of converse)
    crazy
    ∴ Logic.
22. Pass test → admitted to U.
    ~pass
    ∴ ~admitted.
    (Fallacy of inverse)
23. study ∨ make A.
    ~study
    ∴ make A
    (Valid—principle of disjunction)
24. Sony → Good.
    ~Sony
    ∴ ~Good.
    (Fallacy of inverse)
25. Begin at the word "Because"
    Jill works out → feels well
    worked out
    ∴ Feels well
    (Obvious law, Modus ponens, or Law of detachment)
26. Buz, Bird, wings
    Valid Transitive
27. Logic, make sense, Jokes
    Invalid.
28. Begin with "because"
    Theft, Immoral, Justify
    Valid.
29. ~(Not hungry and thirsty)
    = Hungry or not thirsty. (A)
30. $\sim(p \rightarrow q)$ = hypothesis $\wedge \sim$ concl.
    It rains and we do go to store (D)
31. Contrapositive
    If not pass CLAST, then not study (C)
32. ~(Jim golf or Mary Tennis) (D)
    Jim not golf and Mary not tennis
33. Contrapositive
    If not Calif, then not L.A. (A)
34. Lovable, Superv. Work assign.
    No Super. are lovable.
    (C)
35. Pass CLAST → AA.
    AA → Univ.
    Pass CLAST → Univ
    Transitive. (C)
36. Vaccine → not ill
    not ill → not miss work.
    (B) Transitive.
37. i) If then to
    ii) or. (B)
38. i) $p \rightarrow q$ to (B)
    ii) $\sim q \rightarrow \sim p$
39. Pass → graduate
    Pass ∨ get job.
    ~job
    ∴ Pass
    ∴ Graduate (C)
40. I.C.V Yogurt.
    Yogurt → healthy
    Health → marathon.
    ~Yogurt. (D)
    ∴ Ice Cream