FINITE MATH LOGIC EXAM D NAME _____

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

In 1 - 2 state De Morgan's Laws:

1. 2.

In 3 - 8, give negations for each of the following statements:

3. It is rainy or it is cold.

4. It is rainy and it is not cold.

5. If it rains, then it will be cold.

6. Some dogs have fleas. 7. All dogs have fleas.

8. No dogs have fleas.

In 9-11, given: "If you are smart, then you will study for this test."

9. Contrapositive:

10. Inverse:

11. Converse:

In 12-15, given: "If you do not smoke, then your breath is clean."

12. Converse:

13. Contrapositive:

14. Inverse:

15. Which of the above is equivalent to the original statement?

In 16-17, given: "You were lucky if you broke even on the lottery."

16. Converse:

17. Contrapositive:

18. Express the disjunction as an implication:
"You broke even or you were lucky."

19. Express the implication as a disjunction:
"If you broke even, then you were lucky."

In 20-27, use logical principles (name the principle or fallacy!) or Euler circles to determine if the arguments are valid or invalid. Show or explain each answer.

20. If Jane is intelligent, then she earns A's in math. She earns A's in math. Therefore, Jane is intelligent.

21. If Jane is intelligent, then she earns A's in math. She is not intelligent. Therefore, she does not earn A's in math.

22. Jane is not intelligent. I know this because if Jane were intelligent, then she would make A's in math, and she does not make A's in math.

23. If you watch too much TV, then you will go crazy. If you go crazy, then you can't do your homework. You watch too much TV. Therefore, you can't do your homework.

24. All insects have six legs. All fleas have six legs. Therefore, all fleas are insects.

25. All birds have feathers. All penguins are birds. Therefore, all penguins have feathers.

26. All teachers assign work. No people who assign work are lovable. Therefore, no teachers are lovable.

In 27-32, select the correct answer (MULTIPLE CHOICE):

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

28. 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 and Mary is not playing tennis.
   B. Jim is not playing golf or Mary is not playing tennis.
   C. Jim is playing golf and Mary is not playing tennis.
   D. If Jim is not playing golf, then Mary is not playing tennis.

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

30. 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 pass the CLAST, then I will not attend the university.
   C. If I get my AA degree, then I pass the CLAST.
   D. If I pass the CLAST, then I will attend the university.

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

32. 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 graduate.
   B. I did graduate.
   C. I did not pass this test.
   D. None of the above is warranted.

LOGIC EXAM D Solutions

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

3. $\sim$(Rainy $\vee$ cold) = Not rainy and not cold

4. $\sim$(Rainy $\wedge \sim$cold) = Not Rainy or cold

5. $\sim$(If rain, then cold) = It rains and it is not cold.

6. Some dogs have fleas
No dogs have fleas

7. All dogs have fleas
Some do not have fleas

8. No dogs have fleas
Some dogs have fleas.

In 9–11, If smart, then study for test.

9. Contrapos: If you do not study, then you are not smart.
10. Inverse: If not smart, then not study.
11. Converse: If study for test, then you are smart.

In 12–15, If you don't smoke, then breath is clean.

12. Converse: If breath is clean, then you don't smoke.
13. Contrapositive: If breath is not clean, then you smoke.
14. Inverse: If you smoke, then breath is not clean.
15. Contrapositive.

In 16–17, You were Lucky if you broke even or If broke even, then lucky

16. Converse: If you were lucky, then you broke even.
17. Contrapos: If not lucky, then you did not break even.
18. You broke even or you were lucky. (Negating one implies the other!)
If you did not break even, then you were lucky.
or If you were not lucky, then you broke even.
19. If broke even, then you were lucky.
You did not break even, or you were lucky.

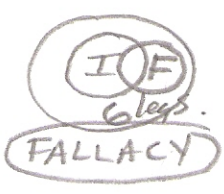
"If I get up, my back hurts"
NOT get up or back hurts

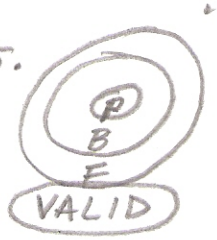
20. $I \to A$, A $\therefore I$ — Fallacy of converse

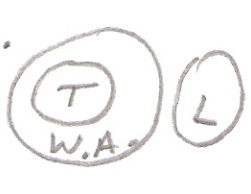
21. $I \to A$, $\sim I$ $\therefore \sim A$ — Fallacy of inverse

22. $I \to A$, $\sim A$ $\therefore \sim I$ — VALID CONTRAPOSITIVE

23. $TV \to C$, $C \to \sim HW$, TV $\therefore \sim HW$ — VALID by TRANSITIVE

24. 

25. 

26. 

27. DeMorgan's: $\sim(\sim H \wedge T)$ = $H \vee \sim T$ (D)

28. DeMorgan's: $\sim(J \vee M)$ = $\sim J \wedge \sim M$ (A)

29. Contrapos. $LA \to$ Calif. $\sim$Calif $\to \sim LA$ (C)

30. $CL \to AA$, $AA \to$ Univ. Transitive $CL \to$ UNIV. (D)

31. i. $p \to q$
ii. $\sim q \to \sim p$
CONTRAPOSITIVE (D)

32. Pass $\to$ Grad
Pass $\vee$ Job
$\sim$Job (Negate one implies other)
$\therefore$ Pass $\to$ Grad (B)