FINITE MATH   LOGIC EXAM E   NAME _____
SHOW ALL WORK ON THIS TEST OR SEPARATE PAPER.   Justify all answers.

In 1 - 2 state DeMorgan's Laws:

1.   2.

In 3 - 7, give negations for each of the following statements:
3. All students are studying.   4. No students are studying.

5. Some students are not studying.

6. The team played well and they did not win the game.

7. If students do not study, then they will fail the test.

8. Express the implication as a disjunction:
    "If you do not study, then you will fail the test."

9. Express the disjunction as an implication:
    "You play well, or you win the championship."

In 10 - 14, given: "If you choose the right person, then you have a
                    good marriage."
10. Converse:

11. Inverse:

12. Contrapositive:

13. Negation:

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

In 15 - 20, given: "If you live in Florida, then you are not used to cold weather."

15. Inverse:

16. Contrapositive:

17. Converse:

18. Give the sufficient condition:

19. Give the necessary condition:

20. Write the statement using "only if."

21. Given: "I will be happy if you win."
    Give the contrapositive.

22. Given: "I will be happy if you win."
    Give the converse.

In 23-32, 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.

23. If it's a Sony, then it must be good. It's not a Sony, so it is probably not very good.

24. If you like logic, then you are cool. You are not cool. Therefore, you do not like logic.

25. If you eat green apples, you will get sick. You are sick. Therefore, you must have eaten green apples.

26. You are in love, or you will pass the test. You passed the test, so you are not in love.

27. Jack is a fake. I know this because Jack is a fake or he loves logic. Jack does not love logic.

28. All logic problems make sense, and some jokes make sense. Therefore, some logic problems are jokes.

29. Sam has a headache today. I know this because if he drinks too much, then he gets a headache, and Sam does drink too much.

30. Birds have wings, and buzzards have wings. Therefore, buzzards are birds.

29. If Joe studies hard, then he will pass the CLAST. If he passes the CLAST, then Joe will be happy. Joe is not happy. Therefore, he did not study hard.

32. Some bad men are successful. Some successful men work hard. Therefore, some bad men work hard.

In 33 - 37, Given: All teachers are intelligent people.
                          Some teachers are funny.

Indicate whether the conclusions are valid or invalid:

33. all intelligent people are funny.   _____

34. All intelligent people are teachers.   _____

35. All funny peopls re intelligent.   _____

36. Some teachers are not intelligent.   _____

37. Some funny people are intelligent.   _____

In 38 - 40, select the correct answer (MULTIPLE CHOICE):

38.   Select the statement below that is logically equivalent to
       "If Tom studies, then he will pass CLAST."

       A.   Tom studies and does not pass CLAST.
       B.   If Tom does not study, then he will not pass CLAST.
       C.   If Tom passed CLAST, then he studied.
       D.   If Tom did not pass CLAST, then he did not study.

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

40. 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.

FINITE MATH LOGIC FORM E Solutions.

1-2. $\sim(p \wedge q) = \sim p \vee \sim q$
     $\sim(p \vee q) = \sim p \wedge \sim q$

3. Some students are not studying.
4. Some students are studying.
5. All students are studying.
6. The team did not play well or they won.

7. $\sim(p \to q) = p \wedge \sim q$
   students do not study and they do not fail.

8. $p \to q = \sim p \vee q$
   You study or you will fail the test.

9. $p \vee q = $ (Negating one, implies the other!)
   $p \vee q = \sim p \to q$ or $\sim q \to p$
   If you do not play well then you win
   or If you do not win, then you play well

In 10-14, Right person $\to$ Good marriage

10. $q \to p$: If good marriage, then right person
11. $\sim p \to \sim q$: If not the right person, then not a good marriage.
12. $\sim q \to \sim p$: If not a good marriage, then not the right person.
13. $\sim(p \to q) = p \wedge \sim q$. You choose the right person and do not have a good marriage.
14. #12 Contrapositive.
15. $\sim p \to \sim q$: If you do not live in Fl, then you are used to cold weather.
16. $\sim q \to \sim p$: If used to cold weather, then you do not live in Fl.
17. $q \to p$: If not used to cold weather, then you live in Fl.
18. Suff: living in Fl.   19. Necessary: Not being used to cold weather.
20. You live in Fl, only if you are not used to cold weather.
21. Win $\to$ happy. Contra = If I am not happy, then you did not win.
22.   Converse = If I am happy, then you won (win).

31. Studies $\to$ Pass
    pass $\to$ Happy
    $\sim$ Happy
    $\therefore \sim$ Study
    Valid by Contrapositive AND Transitive Laws

32.

Invalid.

In 33-37,

Funny
Teach
Intell
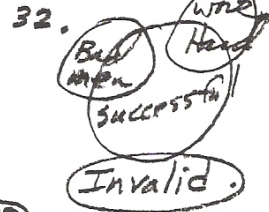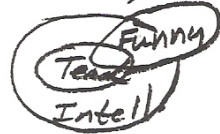
33. Invalid
34. Invalid
35. Invalid
36. Invalid
37. Valid.

38. Contrapos Ⓓ 39. $p \to q$; $\sim p \vee q$ Ⓐ

40. Pass $\to$ Grad.
    pass $\vee$ Get job
    $\sim$ Get Job
    $\therefore$ pass
    $\therefore$ Grad. Ⓑ

23. Smry $\to$ Grad
    $\sim$ Smry
    $\therefore \sim$ Grad.
    Invalid Fall. of Inverse

24. Like logic $\to$ cool
    $\sim$ cool
    $\therefore \sim$ Like logic.
    Valid Contrapos.

25. Apples $\to$ Sick
    Sick
    $\therefore$ Apples
    Invalid Fall of Converse

26. L $\vee$ Pass Test
    Passed
    $\therefore \sim$ Love
    Invalid Fall of Disj.

27. Jack Like $\vee$ Loves logic
    $\sim$ Love logic
    $\therefore$ Fake
    Valid by prin of disjunction.
    Disjunctive syllogism.

28.

Sense
Logic   Ideas
Invalid

29. Drinks $\to$ Headache
    Drinks
    $\therefore$ Headache
    Valid, Obvious Law

30.

Birds   Buzz
Wings.
Invalid