

MGF 1106 TEST 2 REVIEW (15 POINTS) Name:

If we let p = The cat is black. q = The dog is white. r = The bird is green, express each statement in symbols:

- 1) The dog is not white.
- 2) The cat is black and the dog is white.
- 3) The dog is not white or the bird is green.
- 4) If the dog is white, then the bird is not green.
- 5) It is false that the cat is black if and only if the dog is white.
- 6) The cat is black or the dog is white, and the bird is green.
- 7) If the cat is black then the dog is white, or the bird is green.
- 8) If the cat is black, then the dog is white or the bird is green.

Write the negation of each statement. [Do not use language such as "it is false that" or "it is not true that"]

- 9) The sun is shining
- 10) All dogs bark.
- 11) Some cats are brown.
- 12) No grapes are purple.
- 13) I exercise daily and I eat vegetables daily.
- 14) The marker is not red or the marker is green.
- 15) If it is cloudy, then it will rain.

Construct a truth table for each statement.

- 16) $p \wedge \sim q$
- 17) $\sim(p \vee q)$
- 18) $\sim p \rightarrow q$
- 19) $p \leftrightarrow \sim q$
- 20) $(p \vee q) \wedge \sim r$
- 21) $p \rightarrow (\sim q \vee r)$
- 22) $\sim(q \wedge r) \rightarrow p$
- 23) $(p \wedge q) \leftrightarrow (q \vee r)$

If p is true, q is false, and r is true, determine the truth value of each statement.

- 24) $(\sim q \rightarrow r) \wedge p$
- 25) $\sim(p \wedge q) \rightarrow (q \vee \sim r)$

Use truth tables to determine if the two statements are equivalent.

- 26) $\sim(\sim p \rightarrow q), \quad \sim p \wedge \sim q$
- 27) $(p \vee q) \wedge r, \quad \sim(p \wedge q) \vee r$

For the conditional statement: If I am in Atlanta, then I am in Georgia. write its ...

- 28) converse
- 29) inverse
- 30) contrapositive

Use DeMorgan's laws to write an equivalent statement.

- 31) It is false that the test is both long and difficult.
- 32) It is false that the test is long or difficult.

Which, if any, of the three statements are equivalent?

- 33) a) If it is cold, then I wear a coat.
b) If I do not wear a coat, then it is not cold.
c) It is cold or I wear a coat.
- 34) a) if it is hot, then I do not wear a sweater.
b) It is hot or I wear a sweater.
c) It is not hot or I do not wear a sweater.

Translate each argument into symbolic form and state whether the argument is valid or invalid.

- 35) If it rains, then my book will get wet.
My book is wet
 \therefore It rained.
- 36) If it is cloudy, then it will not be hot.
It is hot
 \therefore It is not cloudy.
- 37) If the sun shines, then it will be hot.
If it is hot, then I will be uncomfortable.
 \therefore If I am comfortable, then the sun is not shining.
- 38) The marker is red or the marker is green.
The marker is not green.
 \therefore The marker is red.

Translate each argument into symbolic form and use a truth table to determine whether the argument is valid or invalid.

- 39) The cat is black or the dog is white.
The cat is black.
 \therefore The dog is not white.
- 40) If I win the lottery, then I will be happy.
I do not win the lottery.
 \therefore I am not happy.
- 41) If I study, then I will be confident.
If I am confident, then I will be successful.
 \therefore If I study, then I will be successful.

- 42) Can an invalid argument have a true conclusion? Why?
- 43) Can a valid argument have a false conclusion? Why?

Use Euler diagrams to determine whether each argument is valid or invalid.

- 44) All super-heroes wear costumes. Spider-Man wears a costume.
 \therefore Spider-Man is a super-hero.
- 45) All super-heroes are brave. Wonder Woman is a super-hero.
 \therefore Wonder Woman is brave.
- 46) No cats have feathers. All birds have feathers.
 \therefore No birds are cats.
- 47) All NBA centers are tall. Some tall people are strong.
 \therefore Some NBA centers are strong.
- 48) Some birds are green. All birds have feathers.
 \therefore Some things with feathers are green.
- 49) Some lizards are green. No lizards are dogs.
 \therefore No dogs are green.

Answers:

- 1) $\sim q$ 2) $p \wedge q$ 3) $\sim q \vee r$ 4) $q \rightarrow \sim r$ 5) $\sim(p \leftrightarrow q)$ 6) $(p \vee q) \wedge r$ 7) $(p \rightarrow q) \vee r$ 8) $p \rightarrow (q \vee r)$
 9) The sun is not shining. 10) Some dogs do not bark. (Not all dogs bark.) 11) All cats are not brown (No cats are brown.)
 12) Some grapes are purple. 13) I do not exercise daily or I do not eat vegetables daily.
 14) The marker is red and the marker is not green. 15) It is cloudy and it does not rain.

*Note (answers for truth tables list only the end result, or final column, from top to bottom)

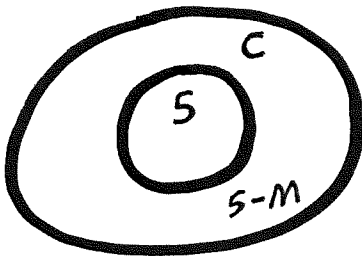
- 16) FTFF 17) FFFT 18) TTTT 19) FTTF 20) FTFTFTFF 21) TTTTTTTT 22) TTTTFFFF 23) TTTFTFFFT
 24) T 25) F 26) FFFT and FFF T (same, so equivalent) 27) TFTFTFFF and TFTTTTTT (different, so not equivalent)
 28) If I am in Georgia, then I am in Atlanta. 29) If I am not in Atlanta, then I am not in Georgia.
 30) If I am not in Georgia, then I am not in Atlanta. 31) The test is not long or the test is not difficult.
 32) The test is not long and the test is not difficult. 33) a and b 34) a and c

- 35) $p \rightarrow q$ 36) $p \rightarrow q$ 37) $p \rightarrow q$ 38) $p \vee q$ 39) $p \vee q$ $[(p \vee q) \wedge p] \rightarrow \sim q$
- | | | | | | |
|--------------------------|------------------------------------|--|-------------------------------|-------------------------------|-----------------------------|
| $\frac{q}{\therefore p}$ | $\frac{\sim q}{\therefore \sim p}$ | $\frac{q \rightarrow r}{\therefore \sim r \rightarrow \sim p}$ | $\frac{\sim q}{\therefore p}$ | $\frac{p}{\therefore \sim q}$ | end result: FT TT (invalid) |
| invalid | valid | valid | valid | | |

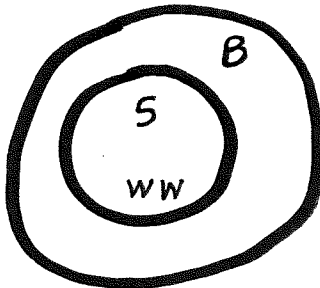
- 40) $p \rightarrow q$ $[(p \rightarrow q) \wedge \sim p] \rightarrow \sim q$ 41) $p \rightarrow q$ $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$
- | | | | |
|------------------------------------|-----------------------------|--|------------------------------|
| $\frac{\sim p}{\therefore \sim q}$ | end result: TT FT (invalid) | $\frac{q \rightarrow r}{\therefore p \rightarrow r}$ | end result: TTT TTTT (valid) |
|------------------------------------|-----------------------------|--|------------------------------|

- 42) Yes. Conclusion may be true, but we can't come to it from only the premises.
 43) Yes. Because the argument uses a false premise.

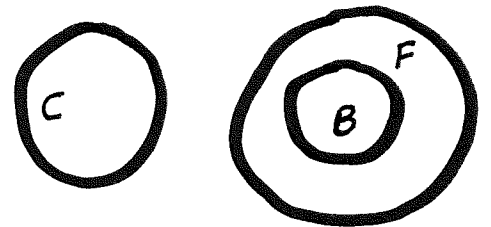
44) invalid



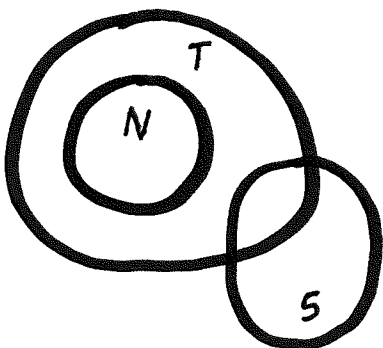
45) valid



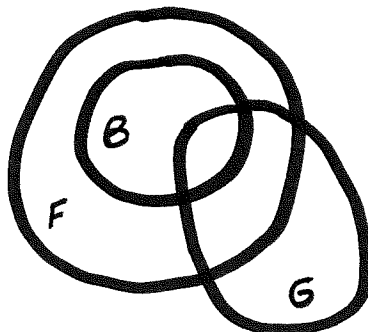
46) valid



47) invalid



48) valid



49) invalid

