

MATH 101
SUMMER 2012
EXAM 2

NAME:

1. 10 pts. each Write the negation of each statement.

- (a) No prions can be seen.
- (b) Some Vulcans are illogical.
- (c) All math courses are loads of fun.

2. 10 pts. each Let

p : Mr. Freeze was foiled last week.
 q : Two-Face is in town.
 r : Batman is on vacation.
 s : The Mad Hatter is off his meds.

Write the following in symbolic form.

- (a) If Mr. Freeze was foiled last week and Two-Face is not in town, then Batman is on vacation.
- (b) Two-Face is in town if and only if Batman is on vacation or Mr. Freeze was foiled last week.
- (c) It is false that Batman is not on vacation and Mr. Freeze was not foiled last week.
- (d) Mr. Freeze was foiled last week and Batman is on vacation, or Two-Face is in town and the Mad Hatter is off his meds.

3. 10 pts. each Make a truth table for each statement.

- (a) $\neg(p \wedge \neg q)$
- (b) $q \vee (p \leftrightarrow \neg q)$
- (c) $p \rightarrow (q \vee r)$

4. 15 pts. Use a truth table to determine whether the statements $(p \rightarrow q) \wedge (q \rightarrow r)$ and $(p \rightarrow q) \rightarrow r$ are equivalent.

5. 10 pts. Use DeMorgan's laws to write an equivalent statement for the sentence: "It is not the case that entropy always increases in an open thermodynamic system or radiocarbon dating is not reliable."

6. 10 pts. Use the fact that $p \rightarrow q$ is equivalent to $\neg p \vee q$ to rewrite the statement "Either the clowns in Congress will listen to the people or the system doesn't work."

7. 10 pts. Write the contrapositive of the statement "If you're not with us, then you're against us."

8. 15 pts. Use truth tables or established logical equivalencies to determine which of the three statements are equivalent.
- i. The car needs a subwoofer, and either the car needs an amp or the car is new.
 - ii. The car needs a subwoofer, and it is false that the car does not need an amp and the car is not new.
 - iii. If the car needs a subwoofer, then the car needs an amp or the car is not new.

9. 10 pts. Determine whether the argument is valid using a truth table:

$$\frac{p \rightarrow q}{\neg q} \\ \hline \therefore \neg p$$

10. 20 pts. Translate the argument into symbolic form, then determine whether the argument is valid using a truth table: “The engineering courses are hard and the chemistry labs are long. If the chemistry labs are long, then the art tests are easy. Therefore the engineering courses are hard and the art tests are easy.”

11. 10 pts. each Use an Euler diagram to determine whether the syllogism is valid.

- (a) No wiener dogs are caterpillars.
No caterpillars are four-legged.

∴ No wiener dogs are four-legged.
- (b) All nutty professors wear tweed coats.
Some tweed coat wearers are not stylish.

∴ Some nutty professors are not stylish.
- (c) Some clowns are scary people.
Some scary people are fascists.
All fascists are clowns.

∴ Some fascists are not scary people.