MATH 1473: Exam #1
Sections 1.1-1.5

Part I: Definitions and basic results

Problem 1: Define the following terms:
   a. valid argument
   b. statement
   c. tautology
   d. negation
   e. conditional

Problem 2: Write the symbolic forms of the following variations of the conditional $p \rightarrow q$:
   a. inverse
   b. converse
   c. contrapositive
   d. biconditional

Problem 3: State DeMorgan’s Laws:

Problem 4: Draw the negation chart:

Problem 5: Rewrite the following conditions in “if . . . then . . .” form:
   a. $p$ if $q$
   b. $p$ only if $q$
   c. No $p$ are $q$
   d. All $p$ are $q$
Part II: Multiple Choice

Problem 6: Which of the following is the negation of the given statement?

No Steven Seagal movies are corny.

a. All Steven Seagal movies are corny.
b. No Steven Seagal movies are corny.
c. Some Steven Seagal movies are corny.
d. Some Steven Seagal movies are not corny.
e. None of these.

Problem 7: Construct a truth table for \((\neg p \lor q) \leftrightarrow r\). How many entries in the final column of the truth table are true?

a. 1
b. 2
c. 3
d. 4
e. None of these.

Problem 8: Which type of reasoning is illustrated in the following argument?

The Oklahoma Thunder won yesterday.
They won today as well.
Therefore, the Oklahoma Thunder win all of their games.

a. Deductive Reasoning
b. Inductive Reasoning

c. None of these.

Problem 9: Which of the following is the converse of the given statement?

All beagles are named Snoopy.

a. If it is named Snoopy, then it is a beagle.
b. If it is not named Snoopy, then it is not a beagle.
c. If it is a beagle, then it is named Snoopy.
d. If it is not a beagle, then it is not named Snoopy.
e. None of these.
Problem 10: Use truth tables to determine which of the following is equivalent to \( \sim p \rightarrow \sim q \).

   a. \( p \land \sim q \)
   b. \( \sim p \land q \)
   c. \( p \lor \sim q \)
   d. \( \sim p \lor q \)
   e. None of these.

Problem 11: Which of the following is a statement?

   a. Take a right on Lindsey, drive three miles, and then turn left on Elm.
   b. Did you hear that the Big XII conference is sticking together?
   c. This sentence is false.
   d. The drive from Norman to Dallas will take 45 minutes.
   e. None of these.

Problem 12: Which of the following is the negation of the given statement?

   I do not have a college degree, or I am employed.

   a. I do not have a college degree, and I am employed.
   b. I have a college degree, and I am unemployed.
   c. I have a college degree, or I am employed.
   d. I do not have a college degree, or I am unemployed.
   e. None of these.

Problem 13: Which of the following is the inverse of the given statement?

   I will eat lunch only if I wake up before noon.

   a. If I do not wake up before noon, then I will not each lunch.
   b. If I eat lunch, then I wake up before noon.
   c. If I do not eat lunch, then I do not wake up before noon.
   d. If I wake up before noon, then I will eat lunch.
   e. None of these.
Problem 14: Is the following a tautology?

\[(p \land q) \rightarrow (p \lor q)\]

a. Yes
b. No

Problem 15: Determine the validity of the given argument:

All Boy Scouts are trustworthy.
Some Boy Scouts are Oklahomans.
Therefore, some Oklahomans are trustworthy.

a. Valid
b. Invalid

Problem 16: Determine if the following argument is valid or invalid:

\[p \rightarrow q\]
\[r \rightarrow p\]
\[\therefore r \rightarrow q\]

a. Valid
b. Invalid

Problem 17: Using the symbolic representations:

\[p: \text{The lyrics are controversial.}\]
\[q: \text{The performance is banned.}\]

Express the following statement in symbolic form:

It is not the case that the lyrics are controversial or the performance is banned.

a. \(\sim p \rightarrow \sim q\)
b. \(\sim(p \lor q)\)
c. \(\sim p \lor q\)
d. \(p \land \sim q\)
e. None of these.
Problem 18: Using the symbolic representations:

\[ p: \text{I am an environmentalist.} \quad q: \text{I recycle my aluminum cans.} \quad r: \text{I recycle my newspapers.} \]

Express the following statement in words:

\[ (q \lor r) \rightarrow p \]

a. If I recycle my newspapers and my aluminum cans, then I am an environmentalist.
b. If I am an environmentalist, then I recycle my aluminum cans or my newspapers.
c. If I recycle my aluminum cans or newspapers, then I am an environmentalist.
d. I recycle my aluminum cans and newspapers or I am an environmentalist.
e. None of these.

Problem 19: Write the negation of the following statement:

Your driver’s license is taken away if you do not obey the laws.

a. Your driver’s license is taken away if you do obey the laws.
b. You do not obey the laws and your driver’s license is not taken away.
c. You obey the laws or your driver’s license is not taken away.
d. If you obey the laws, then your driver’s license is not taken away.
e. None of these.

Problem 20: Construct a truth table for the following statement:

I have a college degree and I do not have a job or own a house.

How many entries in the final column of the truth table are true?

a. 1
b. 2
c. 3
d. 4
e. None of these.

(Bonus) Problem 21: How can the statement “Some \( p \) are \( q \)” be expressed symbolically?

a. \( p \rightarrow q \)
b. \( p \leftrightarrow q \)
c. \( p \land q \)
d. \( p \lor q \)
e. None of these.
Part III: Free Response

Problem 22: Using a truth table, prove that \( \neg(p \lor q) \equiv \neg p \land \neg q \).

Problem 23: Determine the validity of the given argument by following the steps listed below:

No professor is a millionaire.
No millionaire is illiterate.
Therefore, no professor is illiterate.

   a. Define the individual statements:

   b. Rewrite the argument in symbolic form:

   c. Write the conditional representation of the argument:

   d. Construct a truth table for the given argument.

   e. Is the argument valid? Why or why not?