

TMA1201 Tutorial 01 - T1.1 Propositional logic

1. Let p , q and r be the propositions
 p : You get an A in the final exam.
 q : You do every exercise in this book.
 r : You get an A in this class.

Write the following propositions using p , q , r and logical connectives.

- a) You get an A in this class, but you do not do every exercise in this book.
- b) To get an A in this class, it is necessary for you to do every exercise in this book.
- c) You get an A in the final exam, but you don't do every exercise in this book; nevertheless, you get an A in this class.
- d) Getting an A in the final exam and doing every exercise in this book is sufficient for getting an A in this class.
- e) You will get an A in this class if and only if you either do every exercise in this book or you get an A in the final exam.

2. Let p , q and r be the propositions
 p : You have fever.
 q : You miss the final examination.
 r : You pass the course.

Express each of the following propositions as an English sentence.

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

3. Create the truth table for $p \wedge r \vee q \rightarrow \neg p$

4. State the converse, contra-positive, and inverse of the statement “I come to class whenever there is going to be a quiz.”
5. Determine if $(p \rightarrow \neg q \vee r) \wedge q$ is a tautology, contingency or contradiction.
6. By using the methods of (i) truth table and (ii) logical equivalence laws, show that each of the following pairs of compound propositions are logically equivalent.
 - a) $\neg(p \wedge q)$ and $\neg p \vee \neg q$
 - b) $p \leftrightarrow q$ and $(p \wedge q) \vee (\neg p \wedge \neg q)$
 - c) $p \rightarrow (q \vee r)$ and $(p \rightarrow q) \vee (p \rightarrow r)$
 - d) $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ and tautology
7. Determine if $p \leftrightarrow (q \wedge r) \equiv (p \rightarrow r) \vee (\neg q \rightarrow r)$