Study program: Computer Science, VGU
Algebra

Exercise Sheet: Logic

1. Let consider the interpretation v where $v(p) = F, v(q) = T, v(r) = T$. Does v satisfy the following propositional formulas?
   (a) $(p \Rightarrow \neg q) \vee \neg(r \wedge q)$
   (b) $(\neg p \vee \neg q) \Rightarrow (p \vee \neg r)$
   (c) $\neg(\neg p \Rightarrow \neg q) \wedge r$
   (d) $\neg(\neg p \Rightarrow q \wedge \neg r)$
2. Construct a truth table for the formula $\neg p \wedge (p \Rightarrow q)$.
3. Show that $(p \Rightarrow q) \vee (q \Rightarrow p)$ is a tautology.
4. Construct a truth table for $(p \Rightarrow q) \wedge (q \Rightarrow r)$.
5. Write down the negation of the following statements, simplifying so that only simple statements are negated.
   (a) $p \vee \neg q$
   (b) $(p \wedge q) \Rightarrow r$
6. Construct a truth table for $(\neg A \vee B) \Rightarrow (\neg C \wedge D)$.
7. Use a truth table to determine the validity of the argument:
   If Tweety is a bat then Tweety can fly. Tweety is not a bat. Therefore, Tweety can not fly.
8. Use a truth table to determine the validity of the argument:
   If Joe studies hard, he will make the dean's list. Joe made the Dean's list. Therefore, Joe studied hard.
9. Use a truth table to determine the validity of the argument:
   If Joe can afford it, he will ask Sally to go out on a date. If Bill pays Joe the money he owes him then Joe can afford to go out on a date. Joe does not ask Sally to go out on a date. Therefore, Bill did not pay Joe the money he owes him.
10. Use a truth table to determine the validity of the argument:
    If you have high blood pressure then you are at risk for having a stroke. Lynn has high blood pressure. Therefore, Lynn is at risk for having a stroke.