

Homework 4 – MATH 2510 Spring 2019

1. Prove  $C$  from the premises  $\neg A \rightarrow (C \wedge D)$ ,  $A \rightarrow B$ , and  $\neg B$ .
2. Prove  $\neg S$  from the premises  $P \wedge Q$ ,  $P \rightarrow \neg(Q \wedge R)$ , and  $S \rightarrow R$ .
3. Prove  $B$  from the premises  $\neg(A \vee B) \rightarrow C$ ,  $\neg A$ , and  $\neg C$ .
4. Prove  $P \rightarrow Q$  from the premises  $P \rightarrow R$  and  $P \rightarrow (R \rightarrow Q)$ .
5. Prove  $H$  from the premises  $\neg S \wedge C$ ,  $W \rightarrow S$ ,  $\neg W \rightarrow T$ , and  $T \rightarrow H$ .
6. Prove  $A \rightarrow D$  from the premises  $C \rightarrow \neg G$ ,  $A \rightarrow B$ ,  $H \rightarrow D$ ,  $G \vee H$ , and  $B \leftrightarrow C$ .
7. Prove  $F$  from the premises  $D$ ,  $A \rightarrow B$ ,  $E \rightarrow C$ ,  $\neg A \rightarrow (D \rightarrow E)$ , and  $(B \vee C) \rightarrow F$  using the method of proof by contradiction.
8. Translate the English sentence into a sentence involving quantifiers. Clearly define and explain what each predicate you use means.
  - a. All dogs are mammals.
  - b. Some professors are old.
  - c. No republican is a democrat.
  - d. Some integers are not even.
  - e. Not all matrices are symmetric.
  - f. Some topologies are metric spaces.
  - g. Any division algebra that is also associative has dimension 1, have dimension 2, or have dimension 4. (*hint: use different predicates for each statement about dimension*)