Logic and Proof

Construct an ordered binary decision diagram (OBDD) for the formula

\[ ((P \rightarrow Q) \land (\neg R \lor \neg Q)) \rightarrow \neg R, \]

showing each step carefully. What does the OBDD tell us about whether the formula is (a) valid, (b) satisfiable and (c) inconsistent? [10 marks]

Attempt to prove the above formula using the sequent calculus until either it is proved or the proof cannot be continued. [4 marks]

Design a method for determining whether a propositional formula is inconsistent. The method should work by examining the formula’s disjunctive normal form. Demonstrate your method by applying it to the formula

\[ \neg [(P \land Q) \lor (Q \rightarrow P)]. \]

[6 marks]