2011 Paper 1 Question 3

Discrete Mathematics I

This question is about structured proofs.

(a) Write down the introduction and elimination rules for implication and negation. [4 marks]

(b) Using the rules from part (a), give a structured proof of

$$(P \Rightarrow Q) \Rightarrow ((\neg Q) \Rightarrow (\neg P)) \quad \text{[7 marks]}$$

(c) Write down the rule for proof by contradiction. [2 marks]

(d) Using the rules from parts (a) and (c), give a structured proof of

$$((\neg Q) \Rightarrow (\neg P)) \Rightarrow (P \Rightarrow Q) \quad \text{[7 marks]}$$