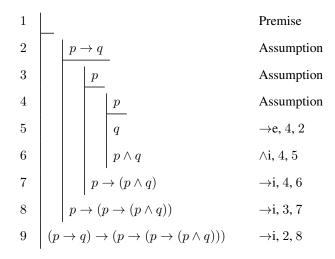
CSC 503 Homework Assignment 2

Out: August 31, 2018 Due: September 10, 2018 Unity ID: zzha

Prove the validity of the following sequents. Use only the basic rules of natural deduction (no derived rules).

1. [10 points]
$$\vdash (p \rightarrow q) \rightarrow (p \rightarrow (p \rightarrow (p \land q)))$$

Answer



2. [15 points]
$$q \rightarrow p \vdash q \rightarrow (p \rightarrow q)$$

Answer

$$\begin{array}{c|cccc} 1 & q \rightarrow p & & \text{Premise} \\ 2 & \hline & q & & \text{Assumption} \\ 3 & \hline & p & & \text{Assumption} \\ 4 & \hline & q & & \text{copy, 2} \\ 5 & p \rightarrow q & & \rightarrow \text{i, 3, 4} \\ 6 & q \rightarrow (p \rightarrow q) & & \rightarrow \text{i, 2, 5} \\ \end{array}$$

3. [15 points]
$$\neg p \to (\neg q \to \neg r) \vdash (\neg p \to \neg q) \to (\neg p \to \neg r)$$

Answer

4. [30 points] $p \lor q, p \to r \lor s, q \to r \lor s, r \to t, s \to t \vdash t$ Answer

1

$$p \lor q$$
 Premise

 2
 $p \to r \lor s$
 Premise

 3
 $q \to r \lor s$
 Premise

 4
 $r \to t$
 Premise

 5
 $s \to t$
 Premise

 6
 p
 Assumption

 7
 $r \lor s$
 $r \lor s$

 8
 $r \lor s$
 Assumption

 9
 $r \lor s$
 Assumption

 10
 $r \lor s$
 Assumption

 11
 $r \lor s$
 $r \lor s$

 12
 $r \lor s$
 $r \lor s$

 13
 $r \lor s$
 $r \lor s$

 14
 $r \lor s$
 $r \lor s$

 15
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 $r \lor s$

 16
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 18
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 $r \lor s$

 19
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 $r \lor s$

 19
 $r \lor s$
 $r \lor s$

 10
 $r \lor s$
 $r \lor s$

 10
 <

5. [30 points] $r \to (p \lor q), p \to s, \neg q, \neg s \vdash \neg r$

Answer