

Assignment: Natural Deduction*

Question 1. (15 marks) Provide a justification (rule and line numbers) for each line of these proofs.

1	$W \Rightarrow \neg B$	Premise
2	$A \& W$	Premise
3	$\neg B \Rightarrow (J \& K)$	Premise
4	W	2, $\wedge E$
5	$\neg B$	4, 1, $\rightarrow E$
6	$J \& K$	5, 3, $\rightarrow E$
7	K	6, $\wedge E$

1	$(W \vee X) \Rightarrow (Y \& Z)$	Premise
2	$\neg Y$	Premise
3	$\neg Y \vee \neg Z$	2, $\vee I$
4	$\neg(Y \& Z) \Rightarrow \neg(W \vee X)$	1, Trans
5	$(\neg Y \vee \neg Z) \Rightarrow (\neg W \& \neg X)$	4, DM
6	$\neg W \& \neg X$	3, 5, $\rightarrow E$
7	$\neg X$	6, $\wedge E$

1	$H \Rightarrow F$	Premise
2	$H \Rightarrow G$	Premise
3	$(F \& G) \Rightarrow I$	Premise
4	$\neg I$	Premise
5	$\neg I \Rightarrow \neg(F \& G)$	3, Trans
6	$\neg(F \& G)$	4, 5, $\rightarrow E$
7	$\neg F \vee \neg G$	6, DM
8	$\neg F \Rightarrow \neg H$	1, Trans
9	$\neg G \Rightarrow \neg H$	2, Trans
10	$\neg H$	7, 8, 9, DE

*from Proofs and Concepts: the fundamentals of abstract mathematics by Dave Witte Morris and Joy Morris