G51MCS - Assignment 1

Venanzio Capretta

11 October 2012

To be handed in by Thursday, 18 October 2012 at 16:00. The work must be stamped and put in the mailbox at the School Office. [Maximum number of points for this assignment: 25.]

Problem 1 Read the first chapter of the lecture notes *"Propositional Logic"*. Write some comments about it. Which parts did you find unclear? Are there sections that should be expanded? Are there paragraphs that you didn't understand? Did you find typos or mistakes?

You must make at least 4 comments, specifying what section and page of the lecture notes they refer to.

[2 points for every comment]

Problem 2 Let A, B, C, D, E, F denote the following propositions:

$A =$ *All humans are mortal.*
$B =$ *The Snark is a Boojum.*
$C =$ *Truth is beauty.*
$D =$ *Beauty is truth.*
$E =$ *There are infinitely many primes.*
$F =$ *The Earth is flat.*

Write propositional formulas that denote the following sentences [1 point each]:

1. *If there are infinitely many primes, then truth is beauty.*
2. *If the Snark is a Boojum, then the earth is flat or not all humans are mortal.*
3. *Truth isn't beauty only if the Snark isn't a Boojum.*
4. *If truth is beauty implies that beauty is truth, then the Earth is flat doesn't imply that all humans are mortal.*
5. *If the Earth is flat and the Snark is a Boojum, then there aren't infinitely many primes.*

Problem 3 Complete the following derivations [2 points each]:

$$\begin{array}{ll} 1 & A \wedge (B \wedge C) \\ \vdots & \vdots \\ \vdots & B \wedge (C \wedge A) \end{array} \qquad \begin{array}{ll} 1 & A \Rightarrow \neg A \\ \vdots & \vdots \\ \vdots & \neg A \end{array} \qquad \begin{array}{ll} 1 & A \vee B \\ \vdots & \vdots \\ \vdots & (A \Rightarrow B) \Rightarrow B \end{array}$$

$$\begin{array}{ll} 1 & A \vee (B \wedge C) \\ \vdots & \vdots \\ \vdots & (A \vee B) \wedge (A \vee C) \end{array} \qquad \begin{array}{ll} 1 & \neg A \vee \neg B \\ \vdots & \vdots \\ \vdots & \neg(A \wedge B) \end{array} \qquad \begin{array}{ll} 1 & A \Rightarrow \neg B \\ \vdots & \vdots \\ \vdots & B \Rightarrow \neg A \end{array}$$