Models of Software Systems **Name: Your name**

Assignment 1

1 Lambda Language

Consider a language with alphabet $\{\lambda, \bullet, (,), x, y, z\}$ and syntax

$$\begin{aligned} \textit{expression} &= \textit{variable name} \mid \textit{expression}, \textit{expression} \\ &\mid \text{“}\lambda\text{”}, \textit{variable name}, \text{“}\bullet\text{”}, \textit{expression} \\ &\mid \text{“(”}, \textit{expression}, \text{“)”}; \end{aligned}$$

$$\textit{variable name} = \text{“}x\text{”} \mid \text{“}y\text{”} \mid \text{“}z\text{”};$$

Are the following wffs of the language? For those that are not briefly explain why.

(a) $\lambda\, x \bullet yz$

(b) $(x)(y)$

(c) $\lambda \bullet x\, \lambda \bullet y$

(d) $(\lambda\, x \bullet x(yz))$

(e) $\lambda\, x \bullet \lambda\, y \bullet xyz$

2 Stars, Derivation

Using the *Stars* formal system that was discussed during the tutorial on week 2 formally shows that $*\diamond{**}\circ{*****} \vdash *\diamond{****}\circ{*******}$

3 Prolog

(a) Implement the problem "Tower of Hanoi" in Prolog. For information about the problem, visit the link below: *https* : *//en.wikipedia.org/wiki/Tower_of_Hanoi*

(b) Implement a program in Prolog that takes two lists of integers and returns a new list containing only the elements that appear in both input lists.

(c) Implement a Prolog program that checks if a given list is a palindrome.