Problem Set 3
COMP301 Fall 2019
17.10.2019 17:30 - 18:45

Problem 1[1]: Write out the derivation of figure 3.4[2] in EOPL, as a derivation tree in the style of the one on EOPL p.5.

Let ρ = [x=⌈33⌉,y=⌈22⌉].

```
(value-of
  <<if zero?(-(x,11)) then -(y,2) else -(y,4)>>
  ρ)

= (if (expval->bool (value-of <<zero?(-(x,11))>> ρ))
    (value-of <<-(y,2)>> ρ)
    (value-of <<-(y,4)>> ρ))

= (if (expval->bool (bool-val #f))
    (value-of <<-(y,2)>> ρ)
    (value-of <<-(y,4)>> ρ))

= (if #f
    (value-of <<-(y,2)>> ρ)
    (value-of <<-(y,4)>> ρ))

= (value-of <<-(y,4)>> ρ)

= ⌈18⌉
```

Figure 3.4 A simple calculation for a conditional expression

[1]EOPL p.70 Exercise 3.4
[2]EOPL p.66

FIGURE 1. Rules of inference style, as seen on EOPL p.5

$$\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{\dfrac{}{\texttt{List-of-Int}}}{\texttt{(Int . List-of-Int)}}}{\texttt{(Int . (Int . List-of-Int))}}}{\texttt{(Int . (Int . (Int . List-of-Int)))}}}{\texttt{(-7 . (Int . (Int . List-of-Int)))}}}{\texttt{(-7 . (3 . (Int . List-of-Int)))}}}{\texttt{(-7 . (3 . (14 . List-of-Int)))}}}{\texttt{(-7 . (3 . (14 . ())))}}$$

Problem 2[3]: Draw the abstract syntax tree for the lambda calculus expressions:

```
((lambda (a) (a b)) c)
```

```
(lambda (x)
   (lambda (y)
      ((lambda (x)
         (x y))
       x)))
```

Please write & draw your answers on a sheet of paper, then upload a readable photo or scan of that to the assignment on BlackBoard.

[3]EOPL p.54 Exercise 2.27