MCS-287 Homework 8 (Spring 2012)

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Due May 10, 2012

- Do Exercise 21.1 on page 468.
- Do Exercise 21.2 on page 468.
- Exercise 23.x1: Using the natural semantics for Language One, show how the conclusion

  $$\texttt{plus(const(4),times(const(3),const(2)))} \rightarrow 10$$

  would be derived. That is, what are the immediately preceding premises from which a rule allows this conclusion to be derived? And for any of those immediately preceding premises that is itself a consequence of applying some rule to earlier premises, what are those? (You can structure this as a tree, as demonstrated in class.)

- Exercise 23.x2: Suppose we replace the natural semantics for Language One with the following nonstandard semantics. Be sure to read it carefully; it does not include a typo:

  $$\frac{E_1 \rightarrow v_1 \quad E_2 \rightarrow v_2}{\texttt{plus}(E_1, E_2) \rightarrow v_1 + v_2}$$

  $$\frac{E_1 \rightarrow v_1 \quad E_2 \rightarrow v_2}{\texttt{times}(E_1, E_2) \rightarrow v_1 + v_2}$$

  $$\texttt{const}(n) \rightarrow 1$$

  1. Show a derivation, using this nonstandard semantics, of a value for the AST

     `plus(times(const(4),const(5)),times(const(6),const(7)))`

     (You can structure this as a tree, as demonstrated in class.)

  2. This nonstandard semantics does not produce the value of an expression in the usual sense of "value." Give a succinct English description of what property of the expression it does produce.

- Exercise 23.x3: Using the natural semantics for Language Two, show how the conclusion

$$\langle \texttt{let(x,const(3),times(var(x),const(5)))}, [\,] \rangle \rightarrow 15$$

would be derived. That is, what are the immediately preceding premises from which a rule allows this conclusion to be derived? And for any of those immediately preceding premises that is itself a consequence of applying some rule to earlier premises, what are those? (You can structure this as a tree, as demonstrated in class.)