17-363/17-663: Programming Language Pragmatics, In-Class Exercises   September 16, 2021

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1. [Small-Step Operational Semantics] Show the derivation for a single step of execution of the following program: $1 + (x \Rightarrow x + 2)(3)$

2. [Substitution] Show the derivations for the first three single steps of execution for the following program: let x = 1 in (let y = (let x = 3 in x) in x+y)

3. [Big-Step Environmental Semantics] Show the derivation of the following expression using the broken call rule. What would the result be under static scoping?

Let f = (g $\Rightarrow$ let x = 2 in g(0)) in let x = 1 in f(y $\Rightarrow$ x))

4. Now show the derivation of the same expression using the correct static scoping rules for functions and calls.