Homework for Ph.D. students

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1. Prove that in Simula programming language if a class A inherits class B, which in Simula's ortography is:
   `B class A ...`
   then there exists a positive integer k such that $decl^k(inh(A)) = decl^k(A)$.

2. Show a (simplified) version of the algorithm bind for Loglan'82. We recall, in Loglan'82 the following property holds

$$inh(A) = bind(B \text{ in } decl(A)).$$

   Moreover, the length of the extended type T is 1. (No declaration of the form `class A extends B.C` ... or `extends B.C.D` ...
   is allowed.)

3. Show a simplified version of the algorithm bind for Simula67.

4. Consider the following program

```
class staticBinding {
    class A { int x; }
    class B extends A {
        class G {
            public G() { System.out.println(x); }
        }
        class C extends A {
            class H extends G {public H() {System.out.println(x); } }
            public C () {x = 2; G gg= new G(); H hh = new H(); }
        }
        public B() { x = 1; C cc = new C(); }
    }
    static B bb;
    public static void main(String[] args) {
    staticBinding mm = new staticBinding(); bb = mm.new B(); }
}
```

Tell what the program will print, if any. Explain why it does so.
Execute the program in as many Java's compilers and JVMs as possible, for example use javac and java, use jikes, use gcj, ... and compare the results.

5. Solve the problem of readers - writers entering a reading room using the alien call protocol. Add some verification.

6.
   - Are coroutines suitable for programming strategic games like chess, checker and the like? Why?
   - Are you able to write towers of Hanoi with coroutines instead of procedures? What is the eventual gain?
   - Imagine a server serving some operations e.g. a BST tree serves operations of : insert, delete, member. Now, one prepares three coroutine objects: I , D, M and calls of the procedures are replaced by the attach(I), attach(D), attach(M) instructions. Tell what will be difference.