Homework 1: Introduction to a Theory of Objects

Due: February 17, 2000

In this homework, will explore some introductory topics in the object calculus of Abadi and Cardelli.

Chapters 1 through 5 of *A Theory of Objects*.

1. Abadi and Cardelli favor structural type equivalence and subtyping rules.
   (a) Summarize, in your own words, their arguments.
   (b) Traditionally, the types of classes in C++ and Java, are compared by name instead of structurally. Similarly, subtyping in C++ and Java is declared (and hence by name). What are we advantages to this rule?
   (c) Is it possible to have a mix of by-name and structural subtyping? How would that work?
2. Are there any practical advantages to having a language that completely separates subtyping and subclassing? Why do so few languages in general use make such a separation? What are the advantages and disadvantages and the trade-offs?
3. Write a critique of the invited talk by Bertrand Meyer given at the 1995 OOPSLA conference which appeared in the addendum to the proceedings. This should be about a page or so long. Imagine that you are a referee for a journal or conference to which this has been submitted. What you accept it for publication? Why or why not?

Chapter 6 of *A Theory of Objects*.

4. Encode the following simple Smalltalk using the untyped calculus of chapter 6. What features of Smalltalk are you omitting in your encoding?

```
class: Point    superclass: Object
instance variables: x y

"class methods"
new: aNumber y: anotherNumber
        ^ super new x: aNumber y: anotherNumber

"instance methods"
x: aNumber y: anotherNumber
        x := aNumber.
        y := anotherNumber.

x
        ^ x

y
        ^y
```