Spring, 1992 Name: ______________________________

CS 541 — Programming Languages 1

Object-Oriented Programming Test (Features, Version 1)

Before you begin, please take a moment to look over the entire test so that you can budget your time.

If you get an incomplete on this test, you can get at most a 'B' on the makeup test.

Don't feel obligated to fill up all the space on the page. Conversely, don't feel limited by the space on the page, since you can use the back if you explicitly tell us on the front when you do so.

1. (5 points) What is a class in Smalltalk?

2. (10 points) What does inheritance mean for instance variables and methods in Smalltalk? Please use examples to help clarify your answer.

3. (10 points) Choose one of the following concepts: abstract data types (data abstraction), message passing, or inheritance, and describe how to apply that concept to some other area of computer science (that is, to an area other than programming language design).

4. (10 points) Suppose that class `C1` is a subclass of class `Object`, and that `C2` is a subclass of `C1`. The methods of each class follow the appropriate comment and are separated by blank lines.

```
"methods of class C1"
fred: x
   ^ 2 * x

wilma: x
   ^ 5 + x

barney: x
   ^ self betty: x

betty: x
   ^ self wilma: x


"methods of class C2"
fred: x
   ^ super wilma: x

wilma: x
   ^ self barney: x

betty: x
   ^ fred: self x
```

For each of the following expressions, describe the execution (in words, especially noting which methods of which classes are called), and give the result the expression (if any). If the expression does not terminate, say that and explain why.

(a) `(C2 new) fred: 8`

(b) `(C2 new) wilma: 9`