# CS 61B: Data Structures (Spring 2002)

# Midterm I

## Solutions

**Problem 1.** (6 points) **Quickies.**

**a.** Another name for static fields is *class variables*.

**b.** Advantages of a linked list over an array (any one will suffice):

- An item can be inserted at the beginning of a linked list without the need to move all the other items.
- The size of a linked list can always be increased by one quickly (specifically, in O(1) time) without ever taking the time to allocate and copy a whole array (which takes O(n) time).

**c.** Advantages of an array over a linked list (any one will suffice):

- Any single item can be read or changed quickly (specifically, in O(1) time) simply by knowing its position in the array.
- An array takes less memory (by a constant factor) than a linked list to store the same number of items.

**d.** Yes. `myMethod` can be overloaded by a second implementation of `myMethod` in `MyClass` that has a different signature. `myMethod` can be overrided by a third implementation of `myMethod` in a subclass of `MyClass` that has the same signature.

**Problem 2.** (8 points) **Inheritance.**

**a.** `m returns 5`

**b.** `int i = ((XPlus) x).r();`

**c.** `return super.m();`

**d.** The very last line of code causes a compile-time error. All the other lines compile and run without incident.

**Problem 3.** (5 points) **Lists made of cons cells**.

```
public static void main(String[] args) {
  Cons v = new Cons();
  v.cdr = new Cons();
  v.cdr.cdr = new Cons();
  v.cdr.cdr.cdr = v.cdr;
  v.car = 2;
  v.cdr.car = 3;
  v.cdr.cdr.car = 9;
}
```

**Problem 4.** (6 points) **Loops made of cons cells**.

```
public void breakLoop() {
  if (cdr != null) {
    if (cdr.car == -1) {
      cdr = null;
    } else {
      int i = car;
      car = -1;
      cdr.breakLoop();
      car = i;
    }
  }
}
```

Extra credit bonus point: Create a special `cons` cell named `dummyCons`, which is not part of any list. Instead of

marking `Cons` cells by setting `car` to -1, mark them by setting `cdr` to `dummyCons`.

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