CSE 231 Spring 1998

HW 2 Due Thurs Apr 23

Problems:

Consider the following example code from HW 1:

```
<s1>            a := 1
<s2>            b := 2
<s3>    L1:     c := a + b
<s4>            d := c - a
<s5>            if (...) then go to L3
<s6>    L2:     d := b * d
<s7>            if (...) then go to L3
<s8>            d := a + b
<s9>            e := d + 5
<s10>           go to L2
<s11>   L3:     b := a + b
<s12>           e := c - a
<s13>           if (...) then go to L1
<s14>           a := b * d
<s15>           b := a - d
<s16>   L4:     e := e - c
<s17>           f := e - a
```

1. Compute the Reaching Definitions for this problem, using the iterative method with sets of definitions (numbered by statement number) as elements of the lattice.
   (a) Show the Gen and Kill sets for each basic block.
   (b) Solve the equations using the Gen and Kill sets, showing the Reachin and Reachout sets for *each* pass over the nodes in the CFG. Use reverse postorder to process the nodes in the worklist.
   (c) How many iterations before the computation terminates?
2. A use of a variable is *upwards exposed* if there is some path in the CFG from the Entry to the use which has no definition of the variable. Define data flow equations for this problem, first defining the local sets (*Gen* and *Kill*) and then giving *Out* and *In* equations.