

Problem Set 5

Fall 23

Due: Sunday, November 19th

1. Dataflow Analysis

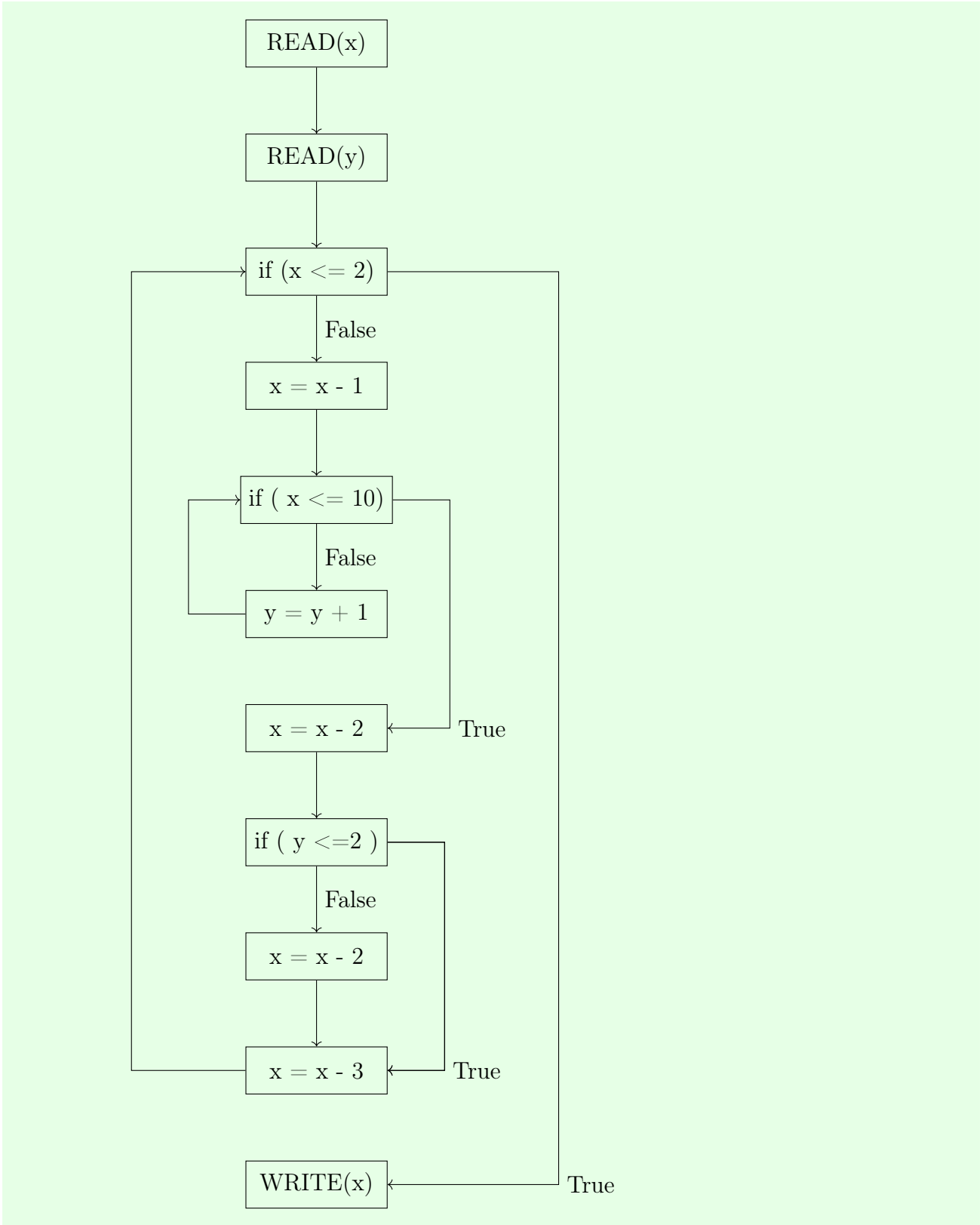
Consider the following code:

```
    READ(x)
    READ(y)
L11 if ( x <= 2 ) goto L3
    x = x - 1
L21 if ( x <= 10 ) goto L22
    y = y + 1
    goto L21
L22 x = x - 2
    if ( y <= 2 ) goto L31
    x = x - 2
L31 x = x - 3
    goto L11
L3  WRITE(x)
    halt
```

(a) Draw the CFG for this piece of code.

Solution:

The CFG is shown below:

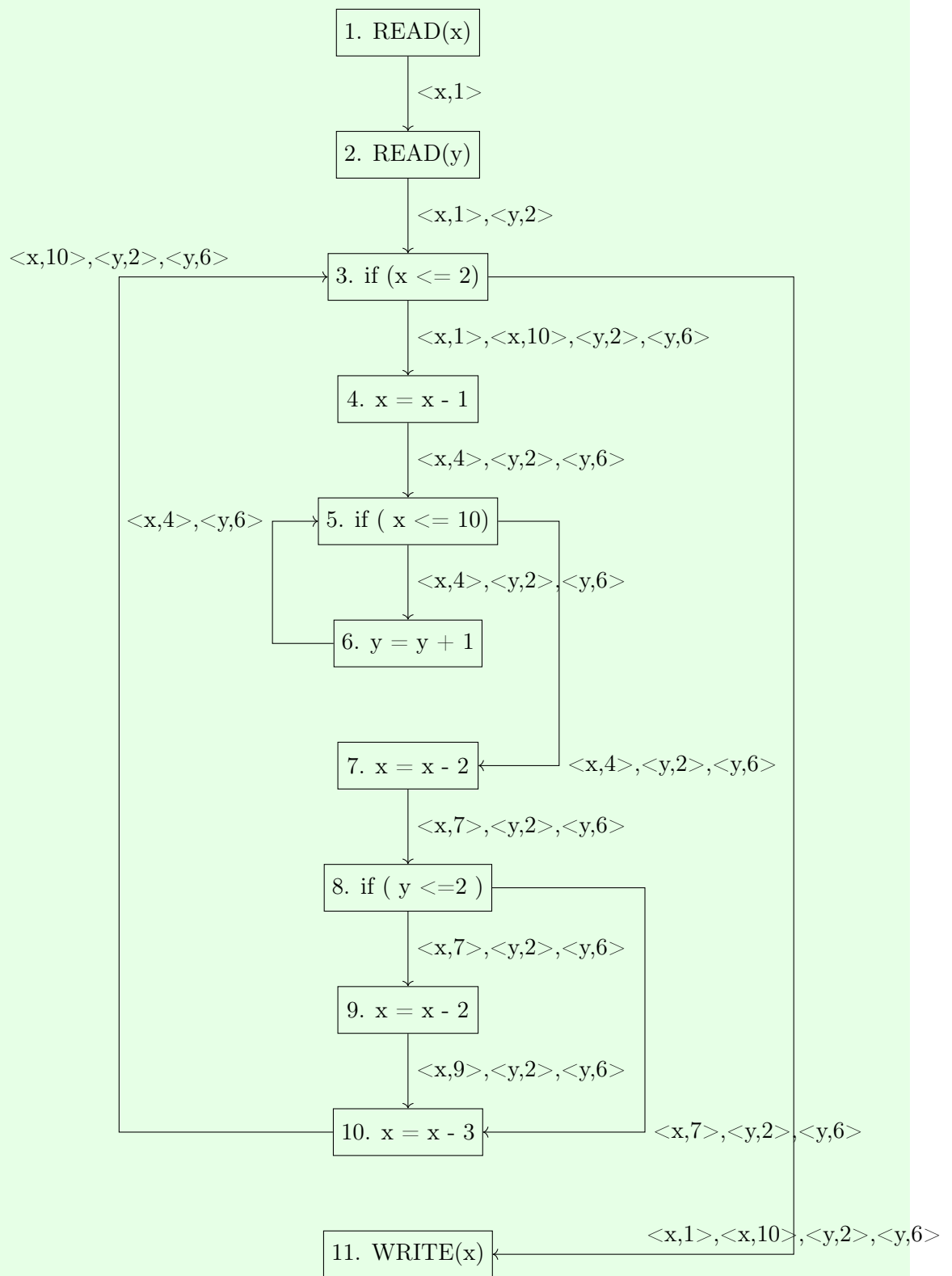


(b) Show the results of running a *reaching definitions* analysis on this code. For each

line of code, show that definitions reach that line. Assume this is the only code in the program.

Solution:

We will represent a definition by $\langle v, n \rangle$, meaning variable v was defined at line n .



(c) Show the results of running a *liveness analysis* on this code. For each line of

code, show what variables are live *out* for that line (i.e., what variables are live immediately after that line would execute).

Solution:

The liveness analysis result is shown below.

