

**Homework #3**  
**Make**  
**Due In Your Lab, September 17, 2003**

Name: \_\_\_\_\_

Lab Time: \_\_\_\_\_

Grade: \_\_\_\_\_/10

**Make**

The GNU online manual for make can be found at:

<http://www.gnu.org/manual/make-3.80/make.html>

There is a link to this address on the class web page in the “reference materials” section. Read the section of this online manual labeled “An Introduction to Makefiles”, and browse the rest of the table of contents so that you can find help on make when you need it.

1. What are the three parts of a make rule? (1 pt.)
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
2. Describe one way in which a makefile is different from a shell script. (1 pt.)
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
3. Write a make rule to compile `file.cc` into `file.o` with the command `g++ -c file.cc` such that the compilation happens only if `file.cc` is newer than `file.o`. (1 pt.)
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
4. What does it mean for a target to be “phony?” (1 pt.)

5. Listed below is a makefile for an imaginary programming language. Draw the dependency graph of that makefile. Hint, clean is a target, and should have a node in the graph. Does clean have any dependencies? Is anything dependent on it? (2 pt.)

```
executable: file1.x file2.x common.s
            compile file1.x file2.x -s common.s

file1.x:   file1.p file1.s
            compile file1.p -s file1.s

file2.x:   file2.p common.s
            compile file2.p -s common.s

clean:
            rm executable file1.x file2.x
```

6. Listed below are the files being built by this makefile with their timestamps. Greater numbers mean a file is newer. I am about to run `make` on the above makefile. For each rule, tell me whether its action will be run. (1 pt.ea.)

|   |            |
|---|------------|
| 3 | executable |
| 7 | file1.x    |
| 6 | file2.x    |
| 5 | file1.p    |
| 2 | file2.p    |
| 4 | file1.s    |
| 8 | common.s   |