CS 250
Homework 4-1, Make, Static Variables, Macros

Due: Friday, Mar. 22, at the beginning of class.

1. A C program consists of four modules: `main`, `alpha`, `beta`, and `gamma`.

   - `Alpha` contains definitions of the functions `a1()` and `a2()`.
   - `Beta` contains definitions of the functions `b1()`, `b2()`, `b3()`, and `b4()`. It also defines a symbolic constant B.
   - `Gamma` contains definitions of the functions `c1()`, `c2()`, and `c3()`.

   Each module uses the following functions:

   - `Main` uses `a1()`, `a2()`, `c2()`, and the constant B.
   - `Alpha` uses `c3()`.
   - `Beta` uses the constant B and `c1()`.
   - `Gamma` does not reference any functions other than those it defines.

   (a) What modules of this program need header files?

   (b) What header files must each of the four `.c` files include?

   (c) Write a Makefile to automatic the building of this program. Your file should define rules for each of the object files, for the executable file, for a `clean` command that deletes all object and executable files, and an `all` command that will build the executable.

2. Write a C function called `count()` that uses a static variable to count the number of times the function itself is called. Store this number in a local variable. The function should take no parameters, but return the number of times it has been called in the past (that is, not including the current call) as its return value.

3. Suppose that a C program contains the following macro:

   ```
   #define DIFF(a, b) a - b
   ```

   Show the code that the preprocessor generates for each of the following C statements.

   (a) `d = DIFF('9', '0');`

   (b) `e = DIFF (a, 0) + DIFF (b, 1);`

   (c) `f = a * DIFF (b, c) / d;`

   (d) `g = DIFF (DIFF (x, y), z);`

   (e) `h = DIFF (x, DIFF (y, z));`