Homework III

1. [40 points]
Provide derivation trees showing that each of the following is a valid expression (i.e., syntax category 'exp') in the Haskell EBNF of Supplement 2 (see class Web page). Derivations from <identifier> to letter-digit strings and <numeral> to digit strings should be shown as a single step (i.e., don't supply details for these parts).

(a) f 2 4
(b) [3, 5]
(c) x+y*z
(d) f 2+3

2. [10 points]
Show the type and explain the result of each of the following Haskell expressions
(a) sqrt 4+5
(b) 'a':'b':[ ]
(c) (2*) 3
(d) [(*), (+)]
(e) fst ((<),(/)) 3 5

3. [20 points]
The Haskell function definition in the file /group/class/c111/Haskell/pal.hs is intended to test a (polymorphic) list to see if it is a palindrome (i.e., reads the same from front to back as from back to front). The given program works correctly in some cases -- for instance pal "abba" ⇒ True and pal "abab" ⇒ False. However, in some cases of other arguments (e.g., "aba"), it does not work properly. Correct the program so that it works correctly in all cases.

4. [30 points]
Write a Haskell definition for a function isVowel :: Char -> Bool which for a given argument x returns True if x is one of the characters 'a', 'e', 'i', 'o', or 'u', and returns False otherwise. Show testing that *fully* justifies the correctness of your program.

Program submission instructions
Solutions to problems 3 and 4 require you to write a Haskell program and must be accompanied by documentation that makes it clear both what general method you used, and how the details of your program accomplish that method. You need to run test cases that exercise **every** component of your code, and include documentation that justifies that your test data meets this condition. The Linux 'script' command is normally used to prepare materials (use 'man script' to see its description). It is *not* the grader's responsibility to figure out how you wrote the program and whether it is correct — it is your responsibility to explain your program *and* convince the grader it is completely

tested and correct. Full credit will not be awarded, even for (apparently) correct programs, without completing these requirements.

To receive a score for programs, you must submit both a printout containing the material indicated above, including a listing of your source program and test outcomes, **and** you should use the 'submit' command to provide an electronic copy of your *source code*. For this homework your submit file should include the source code for your answers to problems 3 and 4. Send it to the directory Hwk3 for course c111**.** Your identification and the time of submission are automatically attached to your electronic submission. There is a link to the description of the submit command on our class Web page.