

Administrivia

- As mentioned in e-mail, sample solution to quiz online.
- Reminder: Homework 3 due today. Points for second problem reduced slightly.
- Homework 4 on the Web. Due in a week.

Slide 1

Functions — Recap

- Functions are useful for
 - Breaking up a non-trivial program into manageable pieces.
 - Avoiding duplication of code.
- Parameters are passed to function “by value”; to allow function to return more than one value, pass “pointers” (roughly, addresses) rather than values.

Slide 2

Functions and Recursion

Slide 3

- Something else we want to be able to do is repeat something some fixed number of times, or until some condition is true. (Examples include iterating over a large collection of values, or until some kind of convergence is reached.)
- We'll talk soon about some new constructs to do that soon, but we can do it now, with *recursion* — having a function call itself.

Recursion — Concepts

Slide 4

- Recursive function is one that calls itself.
- Obviously to make this work we need a way to stop recursing — a *base case* — otherwise we have something akin to the in-joke definition of GNU (“GNU is Not Unix”).
- Also we need to be sure that every recursive call brings us closer to a base case.

Recursion — Implementation

Slide 5

- How it works: When you call any function, the current “state” (values of variables) is preserved (“pushed onto a stack”), and space is reserved for the called function’s local variables (including parameters). When the function returns, this space is freed up again. So if we stack up recursive calls to the same function, each has its own copy of all local variables.
- Simple examples — factorial, Fibonacci numbers, counting(?), sum from input.

Minute Essay

Slide 6

- Many people did not get full credit for the first question on the quiz. I didn't spend a lot of class time on this material, thinking a lot of it was review for many of you. Maybe not? It's far from the most important topic in the course, but I'd like most of you to get it. Review more in class Friday or soon?
- Anything noteworthy to say about Homework 3?