

# Math 248 Computers and Numerical Algorithms–Pruett

## LABORATORY ASSIGNMENT A Bubble-Sorting Subroutine

**Background:** Recall that, in addition to intrinsic functions, Fortran 90 allows **FUNCTION** subprograms and **SUBROUTINES**, which have somewhat different purposes. **FUNCTIONs** return a single value and are accessed simply by using the name of the function (just like the intrinsic functions). **SUBROUTINES**, on the other hand, usually perform more involved tasks, may return several results, and are accessed by a **CALL** statement. A good example of an operation that requires a simple subroutine in Fortran 90 is sorting. Given a vector of numerical values in some random order, return the values in sorted (ascending or descending) order.

- C In class, we demonstrated a “bubble” sort algorithm to arrange a group of students by height. In groups of 4 students (two teams per group), write an algorithm in pseudocode that performs a bubble sort into ascending order.
- C Write and compile a Fortran 90 **MODULE** that contains **SUBROUTINE** **ASCEND\_SORT**, which performs an ascending-order bubble sort. The arguments to the subroutine should be a vector  $x$  that contains a list of real numbers, and  $n$ , an integer that specifies the size of the vector. On return, the vector  $x$  will contain the values in sorted order.
- B Write a main program that **CALLs** your subroutine to sort the list following list: [1.2,0.9,3.7,9.9,8.2,3.3,2.0,0.5].
- A Add another **SUBROUTINE** to your module which performs a descending-order sort. Call it **DESCEND\_SORT**. Hint: cut, paste, and modify.