

AME 20214

Homework 1

Due: Thursday, 5 September 2013, in class

1. Write and execute a **Fortran** program which prints to the screen,

**Hello World!** My name is *your name here*.

Give a hard copy of your source code and output.

2. Take the dimension of the matrix **A** to be  $N \times N$ . Let the  $(i, j)$  element of **A** be defined by the difference  $i - j$ . So if  $N = 3$ ,

$$\mathbf{A} = \begin{pmatrix} 1-1 & 1-2 & 1-3 \\ 2-1 & 2-2 & 2-3 \\ 3-1 & 3-2 & 3-3 \end{pmatrix} = \begin{pmatrix} 0 & -1 & -2 \\ 1 & 0 & -1 \\ 2 & 1 & 0 \end{pmatrix}.$$

Build **A** with two different software tools: 1) **Matlab** and 2) **Fortran**. Plot on a single graph using log-log axes the computational time versus  $N$  for as large a domain of  $N$  as is feasible for each method. Review Sec. 1.5 of the online course notes for guidance in plot preparation. It is important that your font size be both readable and of similar size, neither smaller nor larger, than the main text. Note that **MATLAB**'s default font size is usually too small.

Make your programs as simple as possible, but try to ensure that you have run a fair test. That is to say, make each program have similar structure and operations. To measure the computational time, you can examine the online course notes and use intrinsic timing tools in each package or just use a stopwatch (or if  $N$  is large and you are patient, a calendar!) Include a hard copy of your source code and any output you deem necessary. Note it is not necessary to print the large matrices!

For this course, efficiency and neatness of homework is important. For this homework, there is a *three page maximum page limit*. It is acceptable to cut, paste, and photo-reduce plots and programs as long as they are readable. *Brief* words of explanation in sentence form are necessary to receive full credit. Be sure to follow the homework format specified in the course syllabus.