CPS 5401 Fall 2015
Final Exam Review Guide
Final Exam 10:00am-12:45pm, Thursday, December 10, 2015

The final exam will be comprehensive – that is, it will include material from the entire semester. Please review the Midterm Review Guide and the Midterm Exam for material from the first half of the semester. Learning objectives for the second half of the semester are given below.

Microprocessor Architecture:
· Sketch and describe the architecture of a multicore processor.
· Explain the concept of pipelining and work a problem to find pipeline result rates.
· Sketch and describe the cache and memory hierarchy.
· Explain the concept of vectorization and how it can improve code performance.
· Model performance of a code on a multicore processor using the Roofline model.

Parallel Programming:
· Compare and contrast shared memory and distributed memory parallel architectures. Explain what type of parallel programming paradigm(s) will work on each.
· Given an MPI point-to-point communication example code, evaluate whether or not the code is safe (i.e., no possibility of deadlock).
· Given an OpenMP code example, evaluate whether a race condition exists and if so, rewrite the code to be correct.
· Use MPI collective communications calls correctly to carry out a given communication task.
· Given the portion of a code that can be parallelized, calculate the maximum possible speedup of the entire code using Amdahl's law.

Mathematical Libraries:
· Given that you are writing a program where the major portion of the computation involvessolving a dense linear system of equations, describe what mathematical software library you would use and how you would use it. Would you need to rewrite your program if you moved it to a different machine and/or compiler? Why or why not?
· Given the skeleton of a program intended to solve a linear algebra problem and the prototypes for possible LAPACK routines to use, select the appropriate routine and call it correctly.
· Compare and contrast direct and iterative methods for solving systems of equations. Under what conditions would you use one or the other?