

MA/CS 321:001  
MWF 11:00–11:50  
FB 213  
Fall 2004

Instructor: Russell Brown  
Office: POT741  
Phone: 257-3951  
russell.brown@uky.edu

The final exam will be cumulative. However, there will be an emphasis on material covered since the second exam. Thus, I expect the exam will contain 40% to 50% new material and the remainder will be material from the first two exams.

You will be allowed to use one 8.5 by 11 inch sheet of paper of notes during the exam. You might wish to include a careful statement of Taylor's theorem. In addition, you will want a calculator such as TI-83, 84, 85 or 86.

TOPICS COVERED SINCE THE SECOND EXAM.

- Solving linear systems by naive Gaussian elimination and Gaussian elimination with scaled partial pivoting. Be able to explain the use of the index vector. Diagonally dominant systems.
- Splines. Definition of a  $k$ -spline. Algorithms for computing cubic and quadratic splines.

SOME SUGGESTIONS.

- Study notes from lecture.
  - Study your homework and solutions.
  - Study the previous exams.
  - Study the review sheets for the first two exams.
1. Suppose that we carry out Gaussian elimination with partial pivoting as described in the text. The resulting matrix has the following form where the \*'s represent nonzero elements. What is the index vector? (Obviously, we have not replaced zero entries by the multipliers.)

$$\begin{pmatrix} 0 & 0 & * & * \\ 0 & * & * & * \\ * & * & * & * \\ 0 & 0 & 0 & * \end{pmatrix}.$$

2. Give the result of carrying out naive Gaussian elimination on the matrix:

$$\begin{pmatrix} 1 & 1 & 0 & 0 & 0 \\ -1 & 0 & 1 & 0 & 0 \\ 0 & -1 & 0 & 1 & 0 \\ 0 & 0 & -1 & 0 & 1 \\ 0 & 0 & 0 & -1 & 0 \end{pmatrix}$$

3. Find a quadratic spline polynomial for the partition  $\{-1, 0, 1\}$  and so that  $Q(-1) = Q(0) = Q(1) = 0$  and  $Q'(1) = 1$ .
4. Can you find a cubic polynomial with  $Q(0) = Q(1) = 0$  and  $Q''(0) = Q''(1) = 1$ ?

December 6, 2004