Math 446/546 Spring 2009 Guide for the Final Exam

The final exam is on Thursday 11 June from 8–10am, in our classroom. Bring a calculator for arithmetic.

The exam is cumulative. From Chapters 6, 7, and 9, I will choose problems directly from the tests you already took on those chapters. I will likely choose problems that many people had trouble with on the test. Here are some sample questions from Chapter 10.

1. Consider the nonlinear system of equations

$$\begin{cases} ** x_1 ** x_2 ** = 0 \\ ** x_1 ** x_2 ** = 0 \end{cases} \quad \text{with initial guess} \quad \mathbf{x}^{(0)} = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} * \\ * \end{bmatrix}.$$

   (a) Apply two steps of Newton's method starting at $\mathbf{x}^{(0)}$ to obtain $\mathbf{x}^{(1)}$ and $\mathbf{x}^{(2)}$.

   (b) Starting with $\mathbf{x}^{(0)}$ and $\mathbf{x}^{(1)}$, apply one step of Broyden's method to obtain a different $\tilde{\mathbf{x}}^{(2)}$.

   (c) Apply two steps of the steepest descent technique starting at $\mathbf{x}^{(0)}$ to obtain a different $\tilde{\tilde{\mathbf{x}}}^{(2)}$.

   (d) Describe the relative advantages and disadvantages of these methods.