AMSC 607 / CMSC 764 Fall 2006
Comments on HMWK 1

- The particular modified Newton method that you used, with the shift in the Hessian based on the Gerschgorin bound, is **NOT** a good method. It is too conservative – it modifies the matrix more often than necessary and by a larger amount, so it biases the direction toward the (very slow!) steepest descent direction. I gave this method to you as an example, but you should use a better one if you ever have a real problem to solve.

- Some of you formed the inverse of the Hessian and then multiplied $-g$ by it to get the direction. This gives unnecessary work and round-off error. Use the Cholesky factors: `p = - R\(R' \ g)`, and note that without the parentheses this takes n times longer.

- Some formed the Cholesky factors RR^T, then formed inverses of each of these three matrices, and formed the answer by matrix-vector product. Again, this gives unnecessary work and round-off error.

- When you use `cvsrch`, comment on how you decided on its input parameter settings. In particular, it is important to force `cvsrch` to take an initial step of 1, so that it takes the full Newton step if possible, which should lead to faster convergence.

- Include enough documentation to make your code easy to understand.

- In your comments on the problem with varying c, explain why the modified Newton method is sensitive to c.

- In your comments on how your results compared with the theory of Newton's method, you should have considered the following items:
  - Did you method take the full step ($\alpha = 1$) when you got close to the solution?
  - How does Newton's method behave on quadratic functions? How did your algorithm behave?
  - What is the (local) convergence rate for Newton's method on general functions? What was your local convergence rate?

  - What is special about the 3th function that makes Newton behave differently?

- To determine the convergence rate of your method, try graphing $\log(e^{(k)})$ vs. k and seeing what the slope is.