MATH 8600 (FALL 2018) HOMEWORK 2

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Assigned 09/13/18, due 09/21/18 by 5pm in my office.

1. Textbook **Probs 3.1. 3.3. 3.4. 3.5. 3.7. 3.17.**

2. For a nonlinear system $F(x) = 0$ ($x \in \mathbb{R}^n$), let x^* be a solution, assume that $J_F(x^*)$ is nonsingular, and that all the Hessians $H_\ell = [\frac{\partial f_\ell}{\partial x_i \partial x_j}]$ $(1 \le \ell \le n)$ are finite near x^*. Show that Newton's method

$$x^{(k+1)} = x^{(k)} - \left[J_F(x^{(k)})\right]^{-1} F(x^{(k)})$$

converges quadratically if $x^{(k)}$ is sufficiently close to x^*.

3. Solve the nonlinear system of equations by Newton's method

$$\begin{cases} x_2^2 \cos x_1 + x_1 \ln x_3 = \pi - 4 \\ \cot \frac{x_1}{4} + x_2 x_3^2 = 1 + 2e^2 \\ x_3 \sin x_1 + x_2 \ln x_3 = 2 \end{cases}$$

Let $x^{(0)} = [3\ 3\ 3]^T$ and show the error $e_k = \|x^{(k)} - x^*\|$ where $x^* = [\pi\ 2\ e]^T$.

4. **Prob 9.7.**