AMSC/CMSC 660 Quiz 4 , Fall 2008

Show all work. You may leave arithmetic expressions in any form that a calculator could evaluate. By putting your name on this paper, you agree to abide by the university's code of academic integrity in completing the quiz. Use no books, calculators, cellphones, other electronic devices, communication with others, scratchpaper, etc.

Name _____

1. (a) (5) If we use a quasi-Newton method to minimize a function, why is it important that the approximation to the Hessian be positive definite?

1. (b) (5) Consider the DFP formula for approximating the Hessian inverse:

$$\boldsymbol{C}^{(k+1)} = \boldsymbol{C}^{(k)} - \frac{\boldsymbol{C}^{(k)}\boldsymbol{y}^{(k)}\boldsymbol{y}^{(k)T}\boldsymbol{C}^{(k)}}{\boldsymbol{y}^{(k)T}\boldsymbol{C}^{(k)}\boldsymbol{y}^{(k)}} + \frac{\boldsymbol{s}^{(k)}\boldsymbol{s}^{(k)T}}{\boldsymbol{y}^{(k)T}\boldsymbol{s}^{(k)}}$$

Compute (and simplify) $\boldsymbol{C}^{(k+1)}\boldsymbol{y}^{(k)}$.

2. Let

$$\hat{f}(\boldsymbol{x}) = e^{x_1+x_2} + x_1^2 + x_2^2 - x_1.$$

(a) (5) What are the necessary conditions that must be satisfied if a point $\hat{\boldsymbol{x}}$ is a local minimizer of this function $\hat{f}$?

(b) (5) Write a MATLAB program to apply 5 steps of Newton's method to approximately minimize $\hat{f}$ starting at $\boldsymbol{x}^{(0)} = [1, 0.3863]^T$.