AMSC/CMSC 660 Quiz 6 , Fall 2010

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) Write the formula for computing the step direction in Newton's method for minimizing $f(\boldsymbol{x})$.

(b) (5) Apply one step of Newton's method (with stepsize $\alpha = 1$) to the problem

$$\min_x x^4 + 5x^3$$

starting at the point $x = 3$.

2. Suppose we have a method for minimizing $f(\boldsymbol{x})$, starting from the guess $\boldsymbol{x}^{(0)}$, with the property

$$\|\boldsymbol{e}^{(k+1)}\| \leq 2\|\boldsymbol{e}^{(k)}\|^{1.3},$$

where $\boldsymbol{e}^{(k)} = \boldsymbol{x}^{(k)} - \boldsymbol{x}_{opt}$.

(a) (3) Is the convergence rate linear, superlinear, or quadratic?

(b) (7) If $\|\boldsymbol{e}^{(0)}\| \leq 10^{-2}$, write MATLAB code to compute an upper bound on the number of iterations k necessary to make $\|\boldsymbol{e}^{(k)}\| \leq 10^{-6}$.