AMSC/CMSC 660 Quiz 7 , Fall 2006

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. (10) Write MATLAB code to apply 5 steps of Newton's method to the problem

$$\begin{aligned} x^2y^3 + xy &= 2\,, \\ 2xy^2 + x^2y + xy &= 0\,, \end{aligned}$$

starting at the point $x = 5$, $y = 4$.

2. Consider using a homotopy method to solve the problem

$$\mathbf{F}(\mathbf{x}) = \begin{bmatrix} x^2y^3 + xy - 2 \\ 2xy^2 + x^2y + xy \end{bmatrix} = \mathbf{0}.$$

Our homotopy function is

$$\rho_{\mathbf{a}}(\lambda, \mathbf{x}) = \lambda \mathbf{F}(\mathbf{x}) + (1 - \lambda)(\mathbf{x} - \mathbf{a}),$$

where $\mathbf{x} = [x, y]^T$.

(a) (4) Compute the Jacobian matrix for $\rho_{\mathbf{a}}(\lambda, \mathbf{x})$.

(b) (6) What needs to hold in order that the function $\rho_{\mathbf{a}}$ is transversal to zero on its domain? Why is this likely to be true?