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 _____

1a. (5) Verify that the BFGS matrix

$$\mathbf{B}^{(k+1)} = \mathbf{B}^{(k)} - \frac{\mathbf{B}^{(k)}\mathbf{s}^{(k)}\mathbf{s}^{(k)T}\mathbf{B}^{(k)}}{\mathbf{s}^{(k)T}\mathbf{B}^{(k)}\mathbf{s}^{(k)}} + \frac{\mathbf{y}^{(k)}\mathbf{y}^{(k)T}}{\mathbf{y}^{(k)T}\mathbf{s}^{(k)}}.$$

satisfies the secant condition: $\mathbf{B}^{(k+1)}\mathbf{s}^{(k)} = \mathbf{y}^{(k)}$.

1b. (5) Define $\mathbf{s}^{(k)}$ and $\mathbf{y}^{(k)}$. Why are quasi-Newton matrices designed to satisfy the secant condition?

2. (10) Write a MATLAB program to apply 5 iterations of Newton's method to the problem

$$\min_{\mathbf{x}} (x_1 - 2)^4 + (x_2 + 1)^4 - x_1^2 x_2$$

with a steplength of 1 (i.e, step in the Newton direction without a linesearch) and with an initial starting guess of $\mathbf{x} = [1, 2]^T$.