AMSC/CMSC 660 Quiz 8 , Fall 2003

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, communication with others, scratchpaper, etc.

Name _____

Student number _____

1. (10) Consider the following code for computing a quasi-Newton direction for minimizing a function whose gradient is $g(x)$.

```
function [p,B] = bfgs(s,y,B,g)
% Given a previous Hessian approximation  B,
% update it using s (the change in x)
% and y (the change in g)
% where g is the gradient at the most recent point.
% and then compute a Newton-like direction p.

B = B - (B*s)*(B*s)'/(s'*B*s) + (y*y')/(y'*s);
p = -B \ g;
```

I believe the code is correct, but it is inefficient. Identify two sources of the inefficiency and propose remedies.

2a (5) If we are trying to minimize a function $f(x)$ ($x \in \mathcal{R}^1$) subject to the constraint $x \geq 0$, we can instead solve the **unconstrained** problem

$$\min_y f(y^2)$$

where $y \in \mathcal{R}^1$. Give one advantage and one disadvantage of this approach.

2b. (5) When we compute a search direction for minimizing a function $f(x)$ through the formula $Hp = -g$, where g is the gradient of f evaluated at the current point, why do we want the matrix H to be positive definite?