620-361 Operations Research Techniques and Algorithms

Assignment 1

Due date: Monday, 31st of March

1. Consider the function

$$f(x) = x \ln x - x + 5.$$

It is known that there is a minimum of f in the interval $[0.5, 1.2]$. Apply the

- Fibonacci search;
- Golden section search;
- False position method;
- Newton's method

to find an estimate for this minimum. Use at most 4 calculations of f or any of its derivatives for each method. Which method produces the most accurate estimate?

2. Prove that if you have at least 2 calculations available, Fibonacci search will always result in a strictly smaller interval than golden section search for the same number of calculations. (*Hint: Try starting with an initial interval of length 1. Induction might help.*)

3. Prove that if the function $f(x)$ is bounded below on the interval $[0, \infty)$, there always exists a point which satisfies both the Armijo-Goldstein and Wolff conditions at the same time.

Remember to fill in a plagiarism form! You can find it at the course website (http://www.ms.unimelb.edu.au/ s620361).