SE Course: Numerical Methods

http://www.cs.aaue.dk/~yang/course/NMbasis/NM2010.htm
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MM4: Newton's Iterative Method

1 kl.8:15-9:00, Review of MM3 and Some Examples

- What we talked in MM3;
- Examples of iterative solutions of equations;
- Matlab implementations.

2 kl.9:10-10:40, Exercises for MM3

Question One:

Consider the equation

$$3x^3 - 5x^2 - 4x + 4 = 0 \tag{1}$$

- Show that this equation has a root in the interval $[0, 1]$;
- Use the bisection method to obtain an interval of the length less than $1/8$ containing this solution;
- How many iterations would be needed to obtain this solution with an error smaller than 10^{-6}? Write your m-file.
- By using the function iteration method, two rearrangements of equation (1) are carried out as

$$\begin{array}{l}(i)x = 5/3 + 4/(3x) - 4/(3x^2) \\ (ii)x = 1 + \frac{3x^3 - 5x^2}{4}\end{array} \tag{2}$$

  Define your own functions of (i) and (ii) using Matlab m-files and calculate the first 10 iterations for each rearrangement starting with $x_0 = 0.7$;
- Which of the above iterations will converge to a solution near 0.7?
- Find this solution using a tolerance of 10^{-6}.

Question Two:

Consider the equation

$$exp(x) - 100x^2 = 0 \tag{3}$$

- This equation has exactly 3 solutions, obtain the intervals of the length less than 0.1 containing them using bisection method;
- By using the function iteration method, three rearrangements of equation (1) are carried out as

$$\begin{array}{l}(i)x = \frac{exp(x/2)}{10} \\ (ii)x = 2(lnx + ln10) \\ (iii)x = \frac{-exp(x/2)}{10}\end{array} \tag{4}$$

  Verify that they are all rearrangements of (4);
- Determine which rearrangement will converge to which solution;
- Use these iterations to locate the solutions with tolerance of 10^{-6}.

3 kl.10:50-11:30, Newton's Method

- Reading material: Subsection 2.4 in Textbook.