Homework 2, due Feb. 8

In this homework, we find a minimum of the function

$$f(x) = e^{2\sin x} - x$$

by using the Newton's method and the globally convergent Newton's method.

1. Write a MATLAB function titled as

`function [`f, g, h`] = myfunction(`x`)`

which returns the function value f, its first derivative value g, and its second derivative value h, at x (given as input of the function).

Test that this function returns the correct values.

2. Draw the curve of this function $y = f(x)$ for x on the interval $x \in [-5, 11]$. There are a number of local minimum of this function on this interval.

Apply the MATLAB built-in minimization function `fminbnd` to find a local minimum of this function on the interval $[-5, 11]$, by

`>>` x `= fminbnd('myfunction', -5, 11)`

Mark the obatined point $(x, f(x))$ on the curve of the function to see if it is indeed a local minimum.

3. Apply the simple Newton's iteration following the Algorithm on Page 4 in the Lecture Note to solve $f'(x) = 0$, with initial guess $x_0 = 3$. Stop the iteration when $|f'(x_k)| < 10^{-6}$, i.e., when $|g(x_k)| < 10^{-6}$. Here to obtain the function value and its derivatives, use the function `myfunction` written in Part 1.

Mark the solution point $(x, f(x))$ obtained by this algorithm on the curve of the function to see if it is a local minimum, or something else.

Also plot the vector containing all the values $|g(x_k)|$, $k = 0, 1, 2, \ldots$, obtained in the iteration. Is the rate of cconvergence quadratic? Use `semilogy` for this plot to have better observation of the values.

4. Answer the same questions in Part 3, for the globally convergent Newton's method for minimizing $f(x)$, described on Page 6 in the Lecture Note.