MATH3007 Assignment 8

Due in class (12pm), Nov 28th

Please attach the code (and the figures for Problems 3 and 4) for your answers.

Problem 1 (30pts). Write a computer code in MATLAB using bisection method to find the root of

$$x^{1.7} - 1.7^x = 0.$$

Output a solution with accuracy at least 10^{-5}.

Problem 2 (35pts). Write a computer code in MATLAB using golden section method to solve

$$\begin{aligned} \text{maximize} \quad & \tfrac{pe^{-p}}{1+e^{-p}} \\ & 0 \le p \le 10. \end{aligned}$$

Output a solution with accuracy at least 10^{-5}.

Problem 3 (35pts). Write a computer code in MATLAB using the gradient descent method to solve the optimization problem

$$\text{minimize} \quad e^{1-x_1-x_2} + e^{x_1+x_2-1} + x_1^2 + x_1x_2 + x_2^2 + 2x_1 - 3x_2$$

- Please use $(0, 0)$ as the starting point
- Please use the stopping criterion $||\nabla f(x)|| \le 10^{-5}$.

Please use both the exact line search and the backtracking line search method. Plot a figure of the solution path for each method (similar to the one in the lecture slides). When using the backtracking line search, use parameters $\alpha = \beta = 0.5$.