Homework VII

Deadline: 2017-12-27

1. (10 pts) Whether $f(x) = e^x$ is a strongly convex function and why? What about $f(x) = e^{x^2}$? Detail your arguments.

2. (15 pts) Write your own codes of gradient descent algorithm with backtracking line search ($\gamma = 0.1$ and $\beta = 0.7$) to compute the minimum value of $f(\boldsymbol{x})$, where $\boldsymbol{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} \in \mathbb{R}^2$ and

$$f(\boldsymbol{x}) = e^{\boldsymbol{a}^T\boldsymbol{x}-0.1} + e^{\boldsymbol{b}^T\boldsymbol{x}-0.1} + e^{\boldsymbol{c}^T\boldsymbol{x}-0.1}$$

with $\boldsymbol{a} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$, $\boldsymbol{b} = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$, and $\boldsymbol{c} = \begin{pmatrix} -1 \\ 0 \end{pmatrix}$. Report $f(\boldsymbol{x}_*)$, i.e., the minimum value of f.