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Introduction to Scientific Computing
Homework 7

Exercise 1: **(8 points)**

Consider

$$x_{n+1} = T(x_n) = 2\ x_n - x_n^2.$$

Show that T^2 is a contraction on the interval $\left[\frac{2}{5}, 1\right]$, while T on $\left[\frac{2}{5}, 1\right]$ is not a contraction.

Exercise 2: **(28 points)**

Given two functions:

$$f_1(\mathbf{x}) = 2x_1^2 + 3x_2^2 \tag{1}$$

$$f_2(\mathbf{x}) = x_1^4 + 2x_2^4 \tag{2}$$

(a) Write and run Matlab programs to minimize the two functions respectively by using Newton's method, start from arbitrary initial guess. (18 points)

(b) Compare the performance of the Newton's method on minimizing the two functions, explain the difference. (10 points)