

Supplemental Material For 05/02 Book Reading Seminar

Hiroki Hamaguchi

April 30, 2024

Abstract

This is the supplemental material for the book reading seminar on 2024-05-02.

Please refer to the textbook and whiteboard for the main content.

If necessary, please also refer to [here](#).

Example 1.3.4

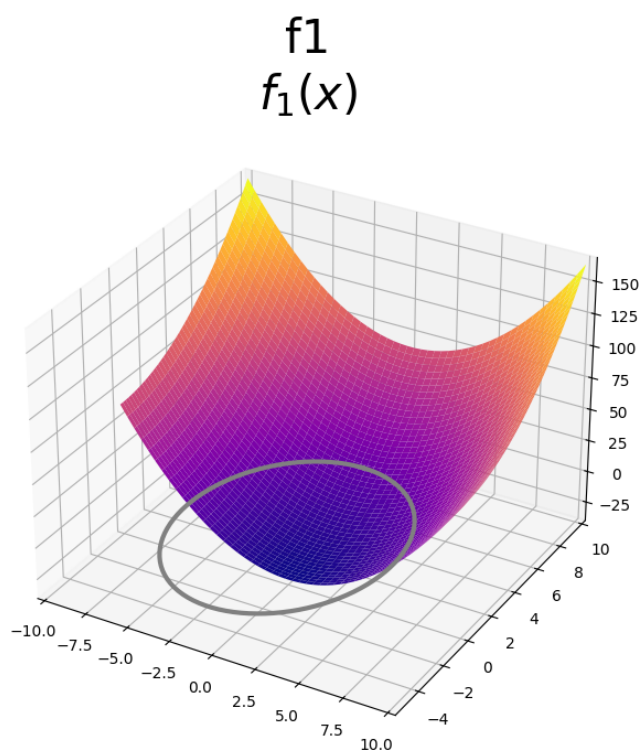


Figure 1

quadraticPenalty
 $\max\{f_1(x), 0\}^2$

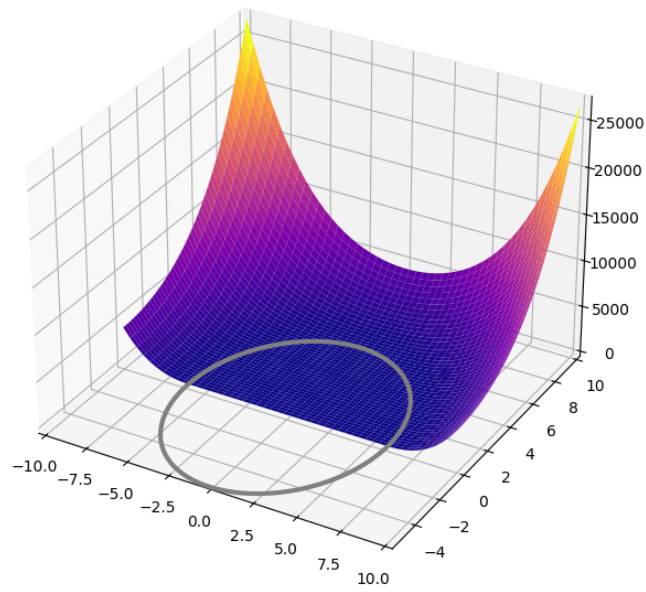


Figure 2

nonSmoothPenalty
 $\max\{f_1(x), 0\}$

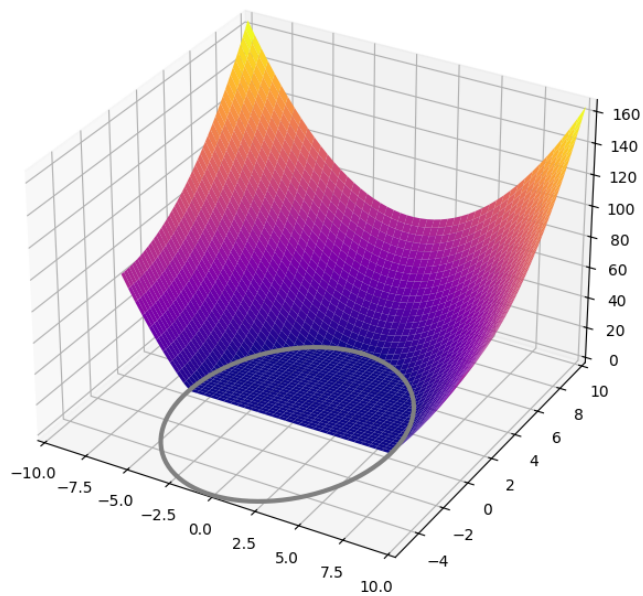


Figure 3

powerFunctionBarrier_withP2
 $1/(-f_1(x))^2$

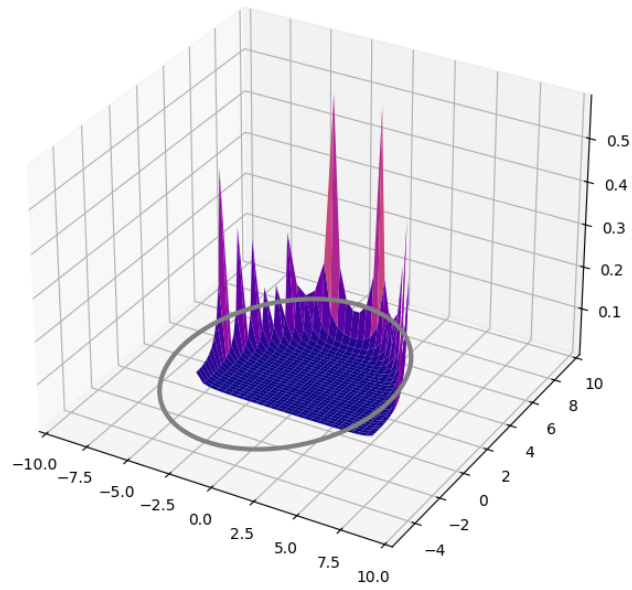


Figure 4

logarithmicBarrier
 $-\log(-f_1(x))$

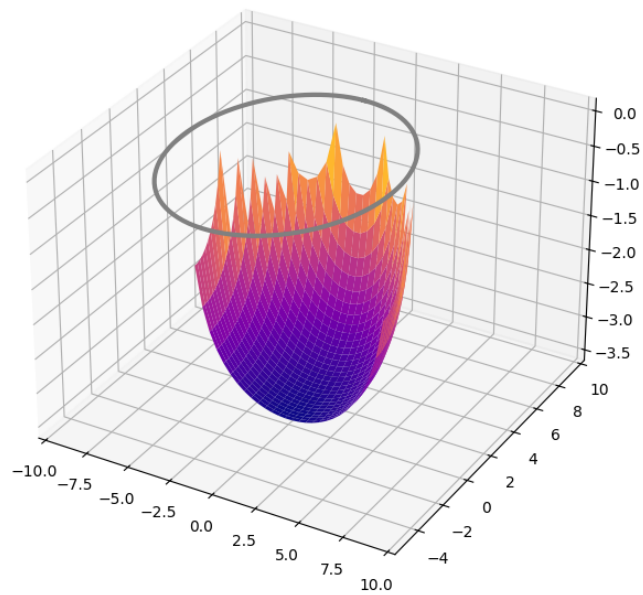


Figure 5

exponentialBarrier
 $\exp(1/(-f_1(x)))$

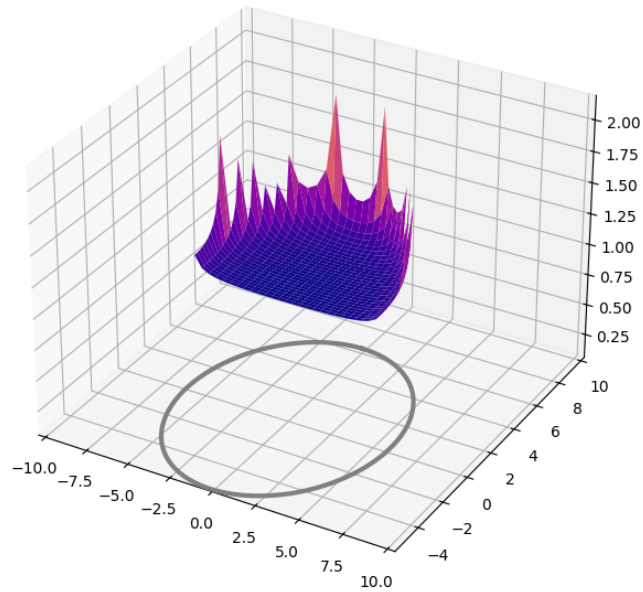


Figure 6

Theorem 1.3.4

Barrier Function Method

$$f_0(x) = (x - 2)^2$$

$$f_1(x) = x^2 - 6^2, F(x) = 1/((-f_1(x))^2)$$

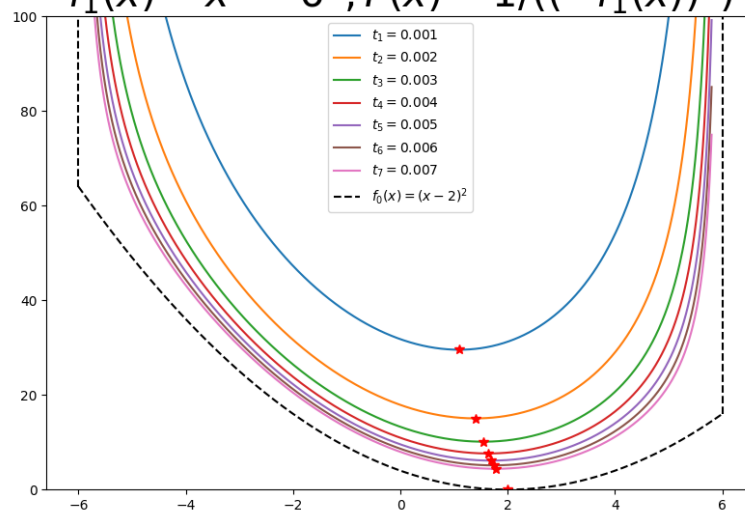


Figure 7

Barrier Function Method

$$f_0(x) = (x - 8)^2$$

$$f_1(x) = x^2 - 6^2, F(x) = 1/((-f_1(x))^2)$$

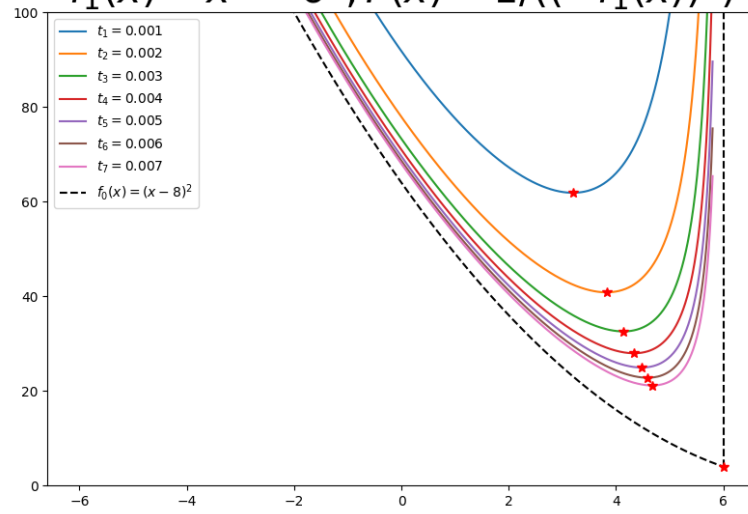


Figure 8

Theorem 2.1.3

$$\langle \nabla f(x) - \nabla f(y), x - y \rangle \geq 0$$

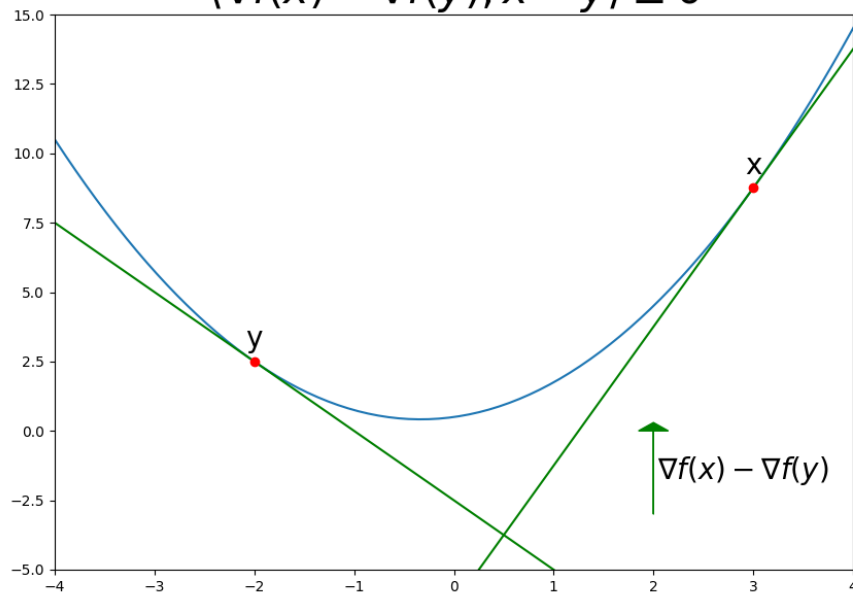


Figure 9

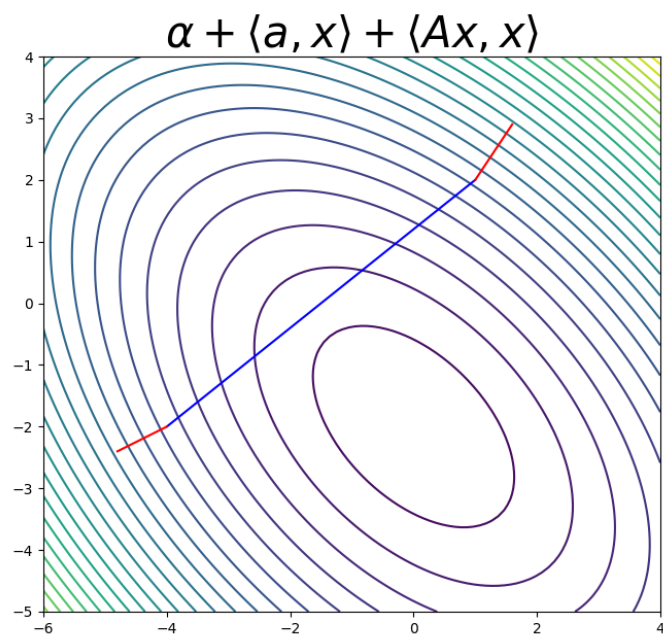


Figure 10

Example 2.1.1

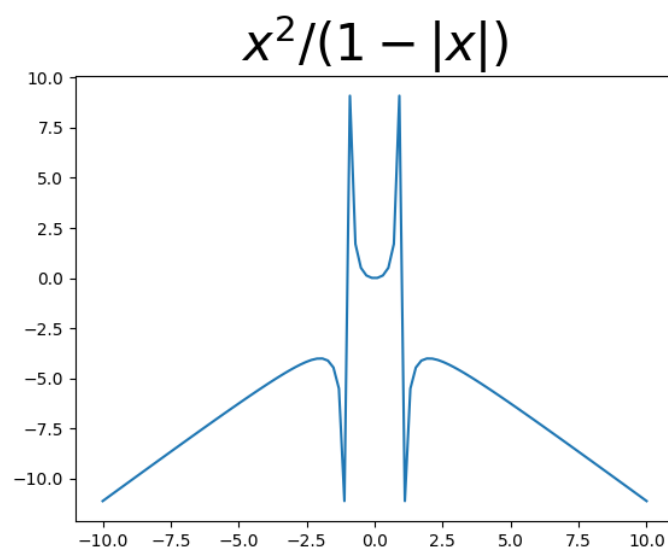


Figure 11

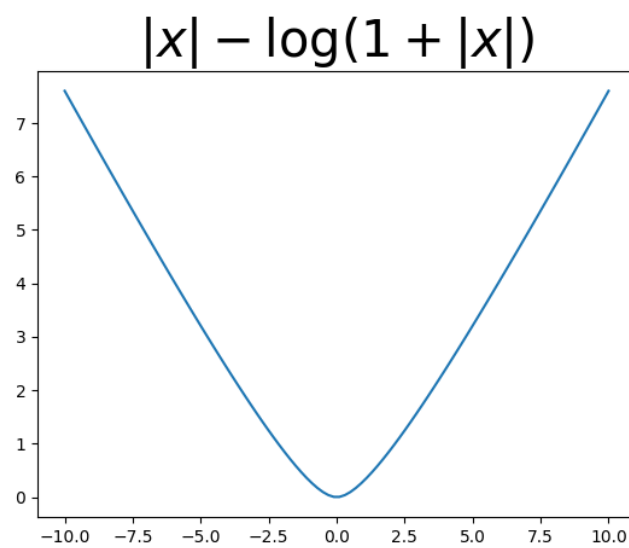


Figure 12

$$\log(\sum_i \exp(x_i))$$

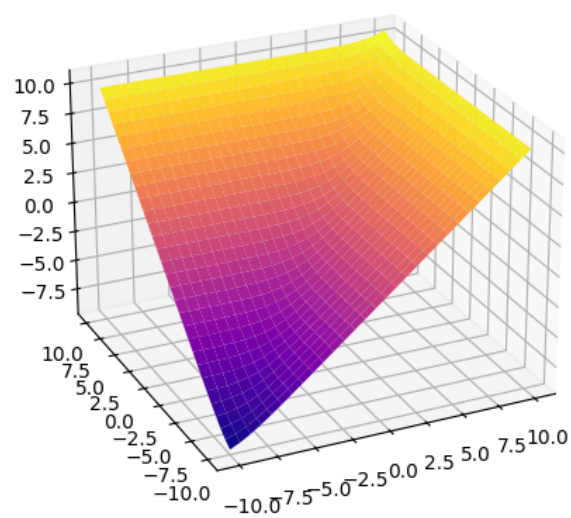


Figure 13

Dual Norm

$$\|g\|_* = \max_{x \in \mathbb{R}^n} \{ \langle g, x \rangle : \|x\|_A \leq 1 \}$$

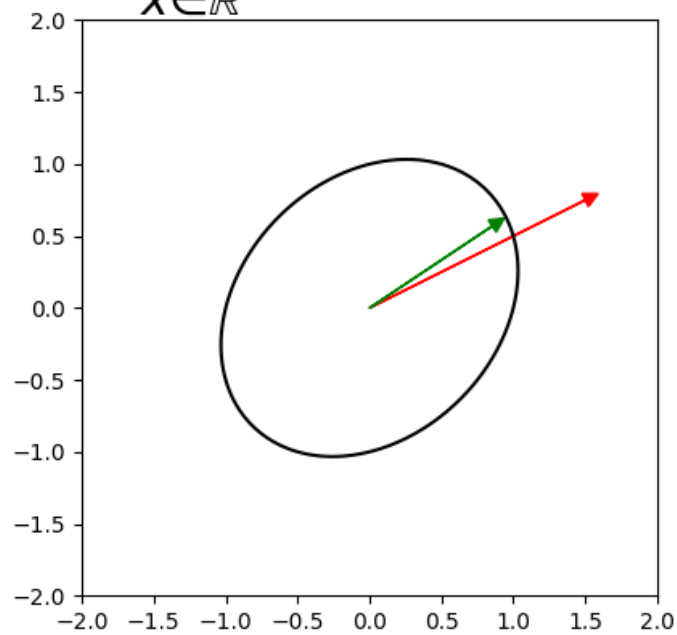


Figure 14

Theorem 2.1.5

$$f(x) = \frac{1}{20}(x^4 + 12x^2), L = 4$$

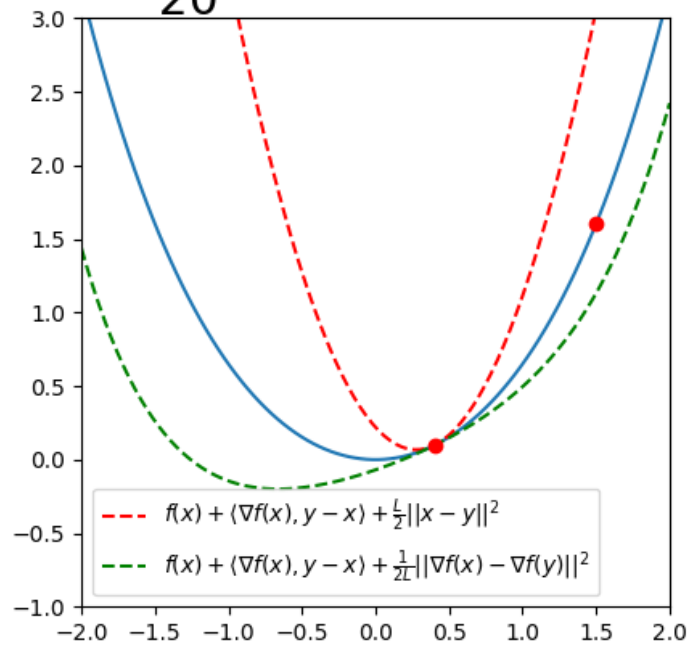


Figure 15

Section 2.1.2

$$f(x) = \frac{L}{4} \left(\frac{1}{2} [x_1^2 + (x_1 - x_2)^2 + x_2^2] - x_1 \right)$$

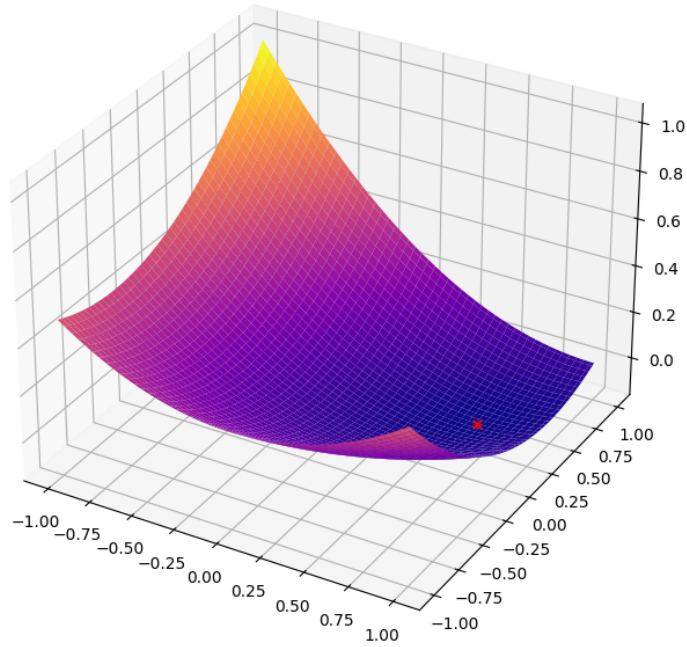


Figure 16

Best solutions \bar{x}_k for $f_k(x)$ with $n = 12$

$$f_k(x) = \frac{L}{4} \left(\frac{1}{2} [x_1^2 + \sum_{i=1}^{k-1} (x_i - x_{i+1})^2 + x_k^2] - x_1 \right)$$

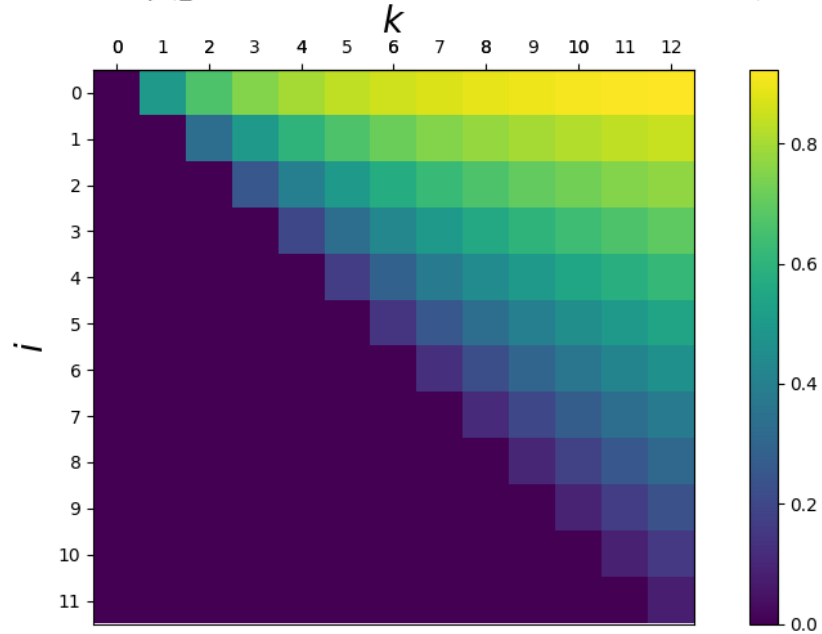


Figure 17

Example 2.1.2

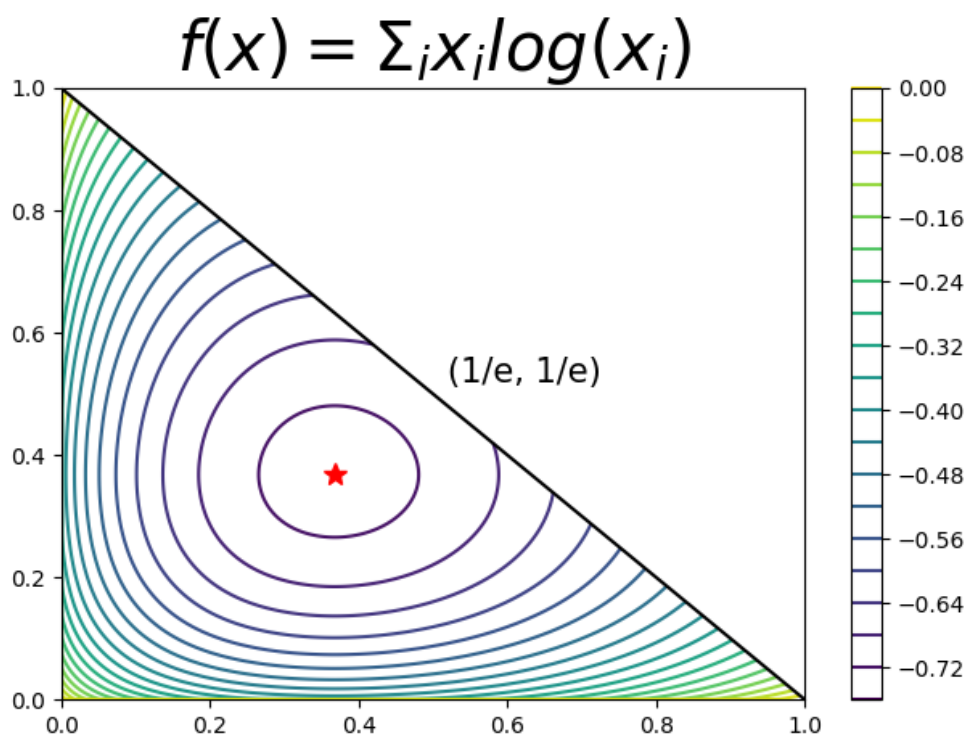


Figure 18