

Math 614 Homework Assignment 2

Due: Feb. 12

Instructions: Write neatly for textbook problems. Projects must be returned in report form and must be type-written. For projects, you must submit your code, output, and description of your algorithm (most important). Late assignments are NOT accepted.

Textbook problems:

Chapter 2 (p. 117-127) Problem 15; Problem 27; Problem 36; Problem 43; Problem 53.

Project:

Write a computer code to find the global minimum of the function:

$$f(x, y) = \exp(\sin(40x)) + \sin(50e^y) + \sin(60 \sin(x)) + \sin(\sin(70y)) - 1/2 \sin(10(x+y)) + 1/4(x^2 + y^2).$$

Hint: you may solve this problem in the following steps:

1. do a simple analysis and plot out the function to see the behavior of the function. You may then restrict your search in a rectangular domain near the origin. How big is the rectangular domain and why do you think the global minimum has to lie in the rectangular domain you picked?
2. notice that the function can be splitted into three parts:
 $f(x, y) = g(x) + h(y) - 1/2 \sin(10(x + y))$, where g is a function of x only and h is a function of y only. Since sine function is always less than or equal to 1 in magnitude, it is reasonable to assume that the local minima of f should be close to those points of (x, y) where g and h achieve their local minima separately.
3. find all local minima of g and h on the interval you determined in step (1).
4. use those local minima of g and h as the initial value together with Newton's method to find the local minima of f and then the global minimum of f .