Assignment: Module 7 Name: Hoyoung kim

Disclaimer: This is my work, not that of others

Total Score: 50

1. 10
2. 10
3. 10
4. 20

1. (10 pts) Problem 7.2

f(x) = -x^2+8x-12  
 a. Determine the maximum and the corresponding value of x for this function analytically, that is, using differentiation

-2x+8 = 0 is f’(x) so x is 4

b. verify that yields the same result based on initial guesses of x1 = 0 x2 = 2 x3 = 6

x4 = 2 – (1/2) (((2-0)^2)(f(2)-f(6)-(2-6)^2(f(2)-f(0)))/(((2-0))(f(2)-f(6)-(2-6)(f(2)-f(0))))

2. (10 pts) Problem 7.5 – Do it by hand for two iterations (not three).   
  
3. (10 pts) Problem 7.6 – Do it by hand for two iterations (not three).   
   
4. (20 pts) Implement the Golden Search algorithm for finding a local minimum in a given interval.   
The basic algorithm is shown in Figure 7.7 in the book. However, it has some efficiencies.   
Python is the preferred language of this assignment. Your function should have the following   
signature:   
   
golden(func, left, right, tol)   
   
func: function to find the minimum   
left: left end value of the interval   
right: right end value of the interval   
tol: Tolerance of the absolute relative error for ending the algorithm, i.e.,   
   
(1−𝑟)𝑥𝑟𝑖𝑔ℎ𝑡−𝑥𝑙𝑒𝑓𝑡  
|𝑥𝑜𝑝𝑡| <𝑡𝑜𝑙 where 𝑟=√5−1  
2 .   
   
The improvement that you will make is that you will only use 𝑟 (or 𝜙) once at the beginning of   
the algorithm to find the original shifting distance, 𝑑. Finding the subsequent distance, 𝑑, for a   
new interval is a matter of subtraction.   
   
Test your algorithm on 𝑥2  
10 −2sin⁡(𝑥) with an initial interval of [0, 4] and a tolerance of machine   
epsilon. Report where the minimum is and the number of function evaluations in finding the   
minimum.