

CS3113, Fall 2008, Homework 5

Due November 5, 2008 (before start of class)

Problem 1

Suppose a given function, $f(x)$, of a single real variable x , has a minimum located at x^* within the interval $[a, b]$. Write a function using the following algorithm to find a minimum of the function, x^* within a given interval. The algorithm, written in pseudo-code, is

```
t = (sqrt(5)-1)/2
x1 = a+(1-t)*(b-a)
f1 = f(x1)
x2 = a+t*(b-a)
f2 = f(x2)
while ((b-a)>tol) do
  if (f1>f2) then
    a = x1
    x1 = x2
    f1 = f2
    x2 = a+t*(b-a)
    f2 = f(x2)
  else
    b = x2
    x2 = x1
    f2 = f1
    x1 = a+(1-t)*(b-a)
    f1 = f(x1)
  end
end
```

After the desired number of iterations is completed, you can take x^* as $x1$, and the value of the function at the minimum as $f1$. Those are the two output values of the minimizer function. The function clearly needs to have a certain number of input arguments. One argument must be a function handle for the function, $f(x)$, whose minimum one is computing. There are, of course, other input arguments as well.

Use an anonymous function to define $f(x)$. For this problem you should let

$$f(x) = 0.5 - x \exp(-x^2),$$

$a = 0$, and $b = 2$. You should try different tolerance levels, `tol` to find reasonable values for this parameter.

Write a script file to set things up and call the minimizer function to find a minimum and the value of the function at the minimum.

Here is the naming convention for the files that you need to submit. Assuming that your last name is Xxx, then the script file should be named XxxHW05.m, and the minimizer function should be named XxxHW05F.m. You should submit those two files separately.

Again, your program will be graded according to the following criteria (in decreasing order of importance):

1. The program should at least run without syntax or runtime errors.
2. The program should be doing what it is supposed to do.
3. The program should be efficient in speed and in the use of memory.
4. The program should be written clearly.