Guidelines

To complete this assignment you must hand in a report including:

1. Title
   - The name of the homework assignment. Ex. “Bisection Method”

2. Description of Problem
   - Description of the problem with a discussion of relevant mathematics. Ex. Explain how and why the bisection method works. Be specific and include a few steps worked out by hand with explanations of each step.

3. Description of the Program
   - Description of your program which describes the algorithm you used and details your implementation. Ex. Explain how you implement the bisection method. You may also copy the relevant piece of code to help explain your implementation.

4. Results and Conclusions
   - Discussion of the results including any tables or figures needed. Ex. Tell me all the roots for the two equations with error bounds. You must also explain why you believe the answer is correct. The correct answer alone is not enough, you have to convince me that it is correct to get credit for it.

5. Program Listing
   - Include all your source code, makefiles and instructions on how to execute your code.

You must also email me your source code, makefiles and instructions on how to execute your code.

- Email me at pgarreau@math.fsu.edu
- Include [MAT5939-04] in the subject line of the email.
4 European Option Prices

Consider the problem of pricing a European Call option on an underlying $S$ at strike $K$. In the Black-Scholes framework, the price of the option expiring at $T$ is given, at time 0 by

$$C(T, S_0) = S_0\Phi(d_1) - Ke^{-rT}\Phi(d_2),$$

where

$$d_1 = \frac{\ln(S_0/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}},$$

$$d_2 = d_1 - \sigma\sqrt{T}.$$

This provided that:

- $S_0 =$ current stock price
- $K =$ strike price of option
- $r =$ constant riskfree interest rate
- $\sigma =$ constant volatility of the stock price
- $T =$ time to maturity.

1. Given the values of the parameters, $K = 10, r = 0.02, \sigma = 0.25, T = 0.25$, compute the price, $C(T, S_0)$, of the options with at least 20 values $S_0$, uniformly spaced between $1$ and $20$.

2. Output the values to a file:

   `'Option_prices.txt'`

3. Graph $C$ vs. $S_0$ for the values computed in this problem using your favorite plotting software (GNUPLLOT is available at [http://www.gnuplot.info/](http://www.gnuplot.info/)).