Scientific Programming

Homework 4: Due 10/16

Practice problems (not to be turned in) Chapter 6 in the book: 2, 4, 5

Homework problems Do not just turn in the answers to the following problems, show the exact Matlab commands you used to find the answer.

1. Write a function that calculates the local maximum or minimum of a quadratic function of the form $f(x) = ax^2 + bx + c$. For the function name and arguments use: [x,y] = maxmin(a,b,c). The input arguments are the constants a, b, and c, and the output are the coordinates (x, y) of the maximum or minimum.

2. (a) When n electrical resistors are connected in parallel, their equivalent resistance R_{EQ} can be determined by: $\frac{1}{R_{EQ}} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}$. Write a function that calculates R_{EQ}, using the function name and arguments REQ = req(R), where R is a vector where each element is a resistor value and the output from the function is R_{EQ}.

   (b) Write a script that uses the function to calculate the equivalent resistance when the following resistors are connected in parallel: $50\Omega, 75\Omega, 300\Omega, 60\Omega, 500\Omega, 180\Omega$, and 200Ω.

3. The Taylor series expansion for $\cos(x)$, where x is in radians, is:

$$\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots = \sum_{n=0}^{\text{inf}} \frac{(-1)^n}{(2n)!} x^{2n}$$

   Write a function that determines $\cos(x)$ using Taylor's series expansion. For function name and arguments use y=cosTaylor(x), where the input argument x is in degrees and the output y is the value of $\cos(x)$. In the program use a loop to add the terms of the series. If a_n is the n^{th} terms of the series, than the sum S_n of the n terms is $S_n = S_{n-1} + a_n$. In each pass calculate estimated error E given by: $E = |(S_n - S_{n-1})/S_{n-1}|$. Stop adding terms when E is less than .000001.