MARMARA UNIVERSITY

FACULTY OF ENGINEERING

COMPUTER ENGINEERING

MATH2059.1 NUMERICAL METHODS

ASSIGNMENT 1

150114032
ŞÜKRÜ GÜMÜŞTAŞ

150115066
ATAKAN ÜLGEN

DUE
01.05.2017 MONDAY 23.59

Question 1

We implemented a function named "plotpoint" for plotting an n^{th} degree polynomial with user defined coefficients, its integral and derivative in the same plot with an interval [x1, x2] with user defined linearly spaced row vector.

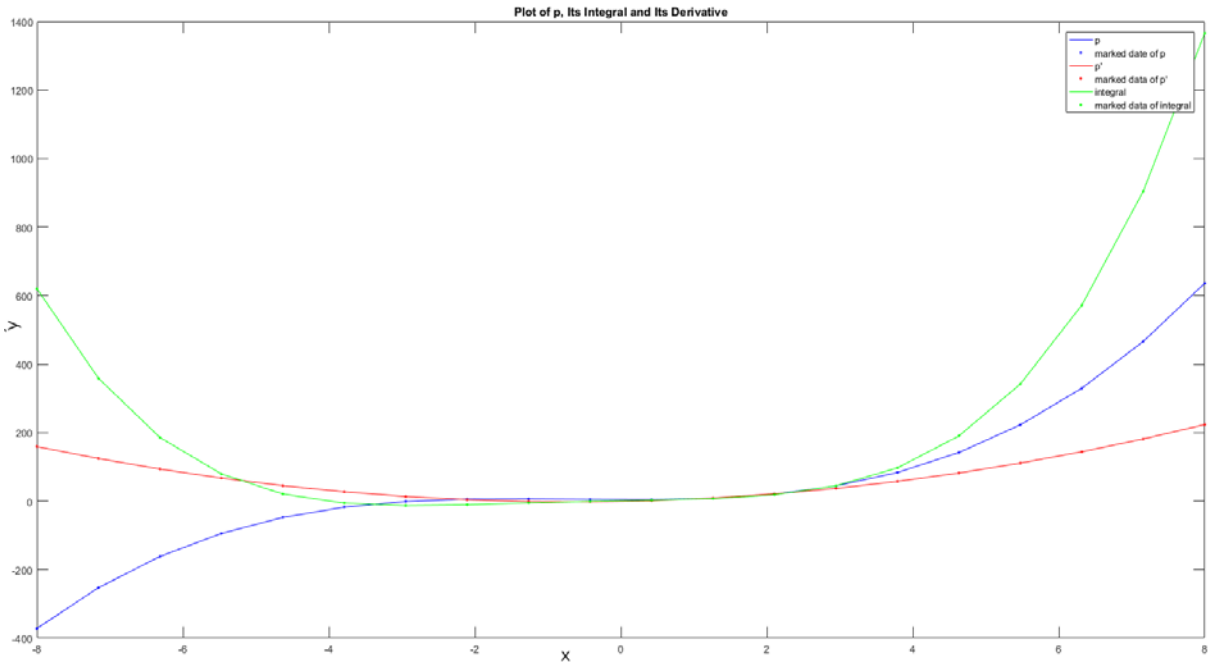
First we get the maximum degree of the polynomial in the function. After that we get the length of coefficients vector. We copy the coefficient values to two different vectors, one is for derivative and the other one is for integral. We erase the last element of derivative coefficients vector and we add constant 1 to the last of integral coefficients.

After doing that we implemented two loops, one is calculating derivative such as, we are starting from the first element of derivative coefficients and multiplying that value with variable that shows maximum power, then iterator increases and maximum power decreases. Loop continues until iterator gets equal to maximum power.

Then we wrote another loop which is calculating integral (since we added 1 to last of this vector, this is now n+1 degree polynomial but coefficients are wrong) such as, we are starting from the beginning of vector. We are dividing first element with the length of real coefficients of normal polynomial then we decrease the length value and increase the iterator.

After that we plot the graph of these three polynomials with the help of functions polyval and plot contained in MATLAB. We are marking linearly spaced values and their calculated values with point.

As an example we plotted related graphs of $f(x) = x^3 + 2x^2 - x + 4$ on interval [-8, 8] with 20 linearly spaced values.



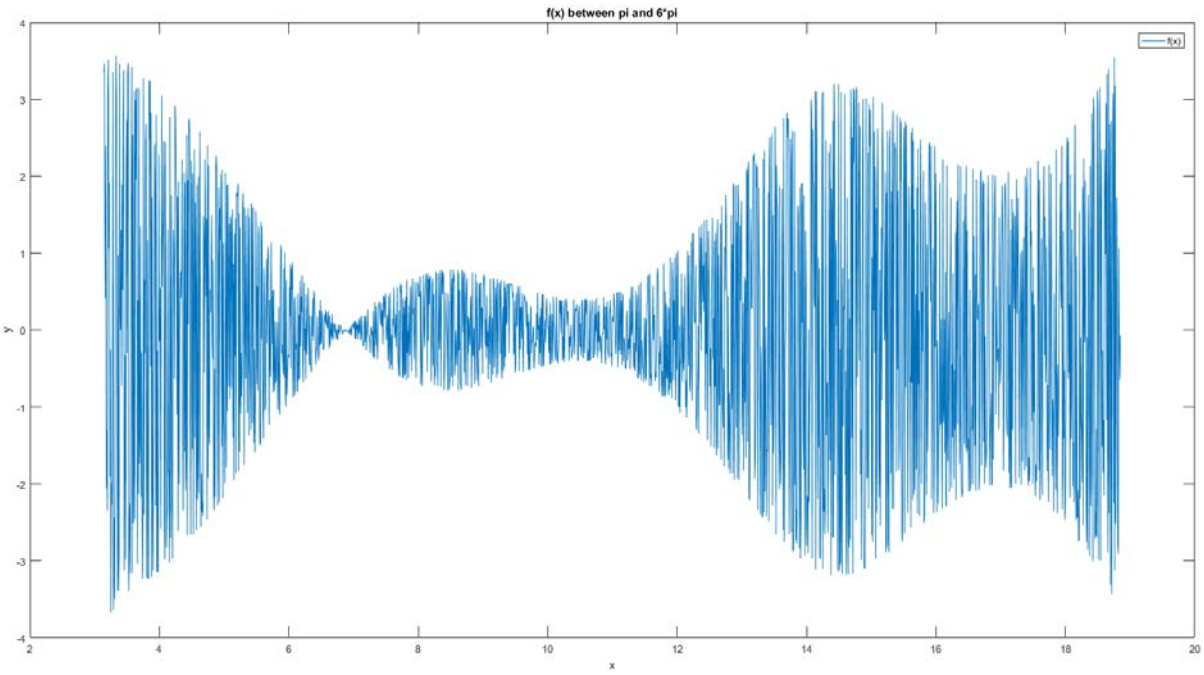
Question 2

We wrote a script named "funcplot" for plotting of f(x) = $3\sin(x^{3x}/x)\tan(\ln(3e^{0.2\sin x}x))$ on interval [pi, 6pi] using 2000 linearly spaced data points.

We implemented f(x) function as $3\sin(x^{3x-1})\tan(\frac{sinx}{5} + \ln(3x))$ in another MATLAB file named SQF.m because it will be used a lot.

Then we created our x values as [pi, 6*pi, 2000] on script. After that we calculated f(x) values via calling SQF in the script and assigned those value to another vector. Then we plotted their graph.

And the result is,



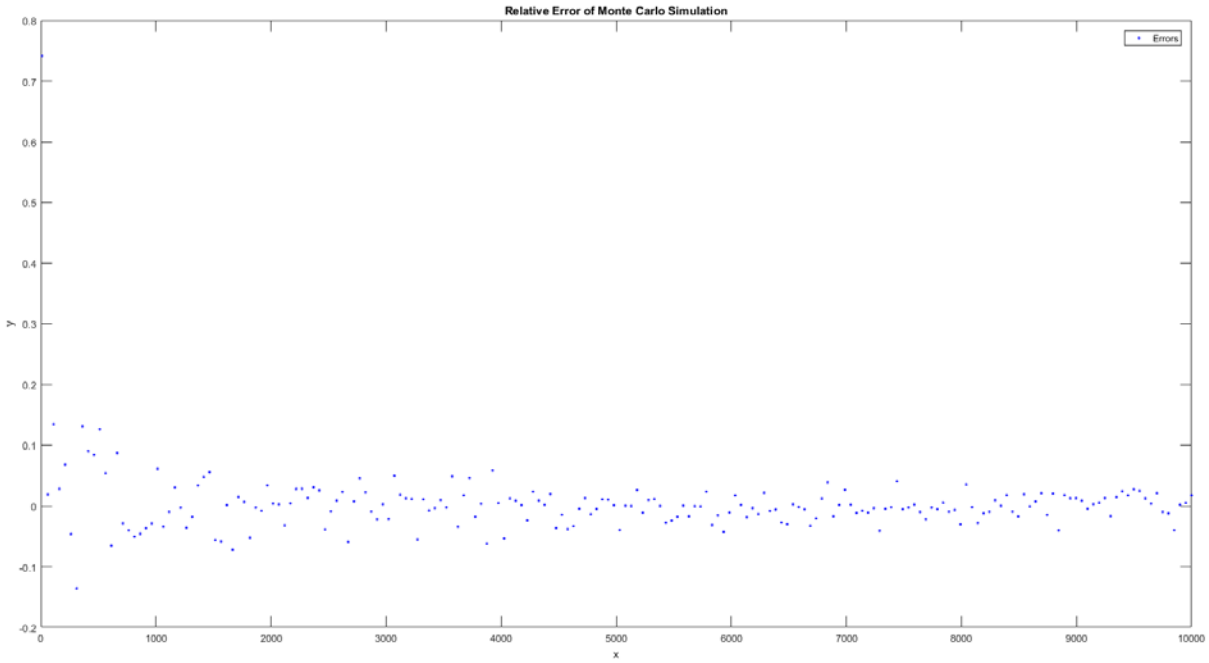
Question 3

We implemented a function named zpi = mypi (numpoints) to calculate approximate value of pi using Monte Carlo simulation.

After that we wrote a script named "ploterr" top lot absolute errors between the approximate values of pi on interval [10, 10000] with 200 linear space and the real value of pi.

We created another 200 elements array. We made a loop such as in every turn of loop, the program calculates the pi value with Monte Carlo simulation using the x value with index of iterator. Then in every step we assigned those values to other vector we created. We used dots to show errors.

The errors are like below. The more we try Monte Carlo simulation, the less we make errors.



Question 4

We wrote a script to find the derivative of Question 2's function with several different methods with three different h values.

We also calculated integral of this function with three different rules with three different h values again.

First we created a h values array then created two 3x3 arrays to hold every calculation. After that we made a loop like the iterator is the index of h vector, we get the h value, make necessary operations in the loop by calling the function in SQF.m, assigning those h value's calculations to arrays.

1st column of derivatives array holds Two Points Method values, 2nd column of derivatives array holds Three Points Method values, 3rd column of derivatives array holds Five Points Method values.

And, 1st column of integrals array holds Trapezoidal Rule values, 2nd column of integrals array holds Simpson's Rule values, 3rd column of integrals array holds Simpson's Three Eight Rule values.

After that we made two different tables with those values and printed them on the screen. The tables are like below.

a part of Question

hValues	TwoPointsMethod	ThreePointsMethod	FivePointsMethod
1	-1.0088	-0.48744	1.0031
0.1	-2.8566	0.27126	0.3545
0.01	-26.164	0.03435	0.04551

b part of Question

hValues	TrapezoidalRule	SimpsonsRule	SimpsonsThreeEightsRule
1	-3.1253	-4.522	-10.918
0.1	-0.31253	-0.4522	-1.0918
0.01	-0.031253	-0.04522	-0.10918