**MATLAB Quiz**

**Spring 2015**

**Version 2**

Exercise1:

a. Given the arrays {(x(i),y(i))| i=1,2,…,n}, with x(i+1)-x(i)=h, for all I,write the MATLAB function that computes:

.

|  |
| --- |
| function T= SumTrap(x,y)  % Inputs: x,y: 2 vectors of the same length  % Output: The above value T given by (1)  h=x(2)-x(1);  n=length(y);  T=y(1);  for i=2:n-1  T=T+2\*y(i);  end  T=T+y(n);  T=T\*0.5\*h;  % Find T  end |

Based on the arrays {(x(i),y(i)| i=1,2,…,n} with n=2k+1, and let h0=x(n)-x(1), consider the array {T(h0),T(h0/2),…,T(h0/2k)} and consequently:

.

Now write the MATLAB function that implements the above formulae (2) and outputs the array T and the lower triangular matrix R of size.

Call for the previous function if needed.

|  |
| --- |
| function [T,R]=Richard(x,y,k)  % Inputs: x,y: 2 vectors of length 2k+1  % k:integer.  % Output: T: a vector of length k+1  % R: a lower triangular matrix of size k×k as given in(2)  T=zeros(k+1,1);  R=zeros(k,k);  % You will need to generate a column vector h of length k+1 with  % h(1)=x(n)-x(1) and h(i)=h(i-1)/2  function [ T R] = richard( x,y,k )  n=length(y);  h=[];  T=[];  R=[];  h0=x(n)-x(1);  for i=1:k  h=[h h0/(power(2,i))]  end  for j=1:k  T=[T sumtrap(x,y)\*(2/(x(2)-x(1)) \*h(j))]  end    for l=1:k  for m=l:k  R=[R (4T(m)-T(2m))/3]  end  R=[R power(4,l)\*R(l)-R(2l)]  end  %%the variable l goes from 1 to k because the first column is full , the  %%variable m goes from l to k because the first row of the second column is  %%empty the first two row of the third too...            end |

Test the function **Richard** using the following inputs:

x=linspace(0,3,5), and y={y(1),…,y(5)} such that y(i)=sin ((x(i))2).

|  |
| --- |
| %copy the commands you used and the results T and R in this space  T=  R= |

Exercise 2:

Let be the function defined by the following series:

, for all x

with:

Express as a function of by finding such that:

Use the above relation in writing the MATLAB function **T(x,p)** to approximate f(x) up to a precision **p**, described below.

|  |
| --- |
| function [t,N,y]=T(x,p)  % Input: x a number  % p an integer >=2  % Output:N: least integer such that  % t: array  % y:approximation to f(x)  function [ t,N,y ] = ex2( x,p )  t=[x/2];  i=1;  while t(i)>0.5\*power(10,1-p)  t=[t (formula)]  end  f=f+t(i)  End |

Test the function **T(x,p)** using x=1 and p=3,7,10. The results should be expressed in double precision.

|  |  |
| --- | --- |
| **P** | **T(x,p)** |
| 3 |  |
| 7 |  |
| 10 |  |