ME 594 – Numerical Methods – HW06

Viral Panchal | Due Date: 11/02

“I pledge my honor that I have abided by the Stevens Honor System”

Graphical user interface, text, application, email

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**Matlab Program:**

* ***Script for Thomas algorithm***

% Function to implement thomas algorithm

function x = thomas\_alg(a,b,c,rhs)

n = length(rhs);

c(1) = c(1)/b(1);

rhs(1) = rhs(1)/b(1);

b(1) = 1;

for k=2:n

b(k) = b(k) - a(k-1)\*c(k-1);

rhs(k) = rhs(k) - a(k-1)\*rhs(k-1);

if (k < n)

c(k) = c(k)/b(k);

end

rhs(k) = rhs(k)/b(k);

b(k) = 1;

end

x(n) = rhs(n);

for k = n-1:-1:1

x(k) = (rhs(k) - (c(k) \* x(k+1)));

end

x = x';

* ***Script for plotting splines***

% generalised function to plot splines

function spline\_plot(t,y)

n = length(t) -1;

a = ones(n,1);

b = ones(n+1,1);

b = b\*4;

b(1) = 2;

b(n+1) = 2;

c = ones(n,1);

rhs(1) = 3\*(y(2) - y(1));

rhs(n+1) = 3\* (y(n+1)- y(n));

for i = 2:n

rhs(i) = 3\*(y(i+1) - y(i-1));

end

d = thomas\_alg(a,b,c,rhs);

aa = zeros(n,1);

bb = zeros(n,1);

cc = zeros(n,1);

dd = zeros(n,1);

for i = 1:n

aa(i) = y(i);

bb(i) = d(i);

cc(i) = 3\*(y(i+1)-y(i)) - 2\*d(i) - d(i+1);

dd(i) = 2\*(y(i)-y(i+1))+d(i)+d(i+1);

end

u=linspace(0,1,101);

plot(t,y,'\*-');

xlabel("t");

ylabel("y");

hold on

grid on

axis padded

for i=1:n

tt = u\*(t(i+1) - (t(i))) + t(i);

yy = aa(i) + bb(i) \* u(:) + cc(i) \* u(:).^2 + dd(i) \* u(:).^3;

plot(tt,yy,'-k')

end

legend('Linear spline','Cubic spline')

* ***Driver to run the above functions***

% Q4 driver  
close all  
clear all  
clc  
  
t = [1.3 1.7 1.9 2.3 2.7 3.1 3.6 4.0];  
y = [2.8 3.2 3.1 3.5 4.8 4.2 5.3 4.8];  
  
spline\_plot(t,y)

**Matlab Output:**

Chart, line chart

Description automatically generated

[*Published with MATLAB® R2021a*](https://www.mathworks.com/products/matlab)