**Homework 03**

Mech307

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1)



        Root #  |  x

--------------------------------------

         1     |  0.3927

         2     |  1.1781

         3     |  1.9635

         4     |  2.2832

         5     |  2.7489

         6     |  3.5343

         7     |  4.3197

         8     |  5.1051

         9     |  5.4248

         10   |  5.8905

         11   |  6.6759

         12   |  7.4613

         13   |  8.2467

         14   |  8.5664

         15   |  9.0321

         16   |  9.8175

2)



3)

ans =

4.4770

4)



5)





6)

Except c = 2.3542, for all the values of c there are unique solution.

For c = 2.3542 there are infinitely many roots.

7)

At step 20 x = 0.0000 y = 1.4142 z = 1.4423 err = 0.0007

At step 21 x = 0.0000 y = 1.4142 z = 1.4422 err = 0.0000

8)

At step 1 x = 1.7826 y = 3.2853 err = 0.3586

At step 2 x = 1.7889 y = 3.2974 err = 0.0136

At step 3 x = 1.7888 y = 3.2973 err = 0.0000

9)



Codes:

Pr1)

clc;

clear all;

close all;

x = 0:0.0001:10;

y = 100\*exp((-0.1)\*x).\*cos(4\*x+pi).\*sin(x+4);

counter = 0;

yref = y(1);

disp('        Root #  |  x ');

disp('--------------------------------------');

for i = 2:length(x)

if ((y(i)\*yref) <= 0)

counter = counter + 1;

xroot(counter) = x(i);

yroot(counter) = y(i);

yref = -yref;

if(counter<10)

fprintf('         %.0f     |  %.4f \n',counter,x(i));

else

fprintf('         %.0f   |  %.4f \n',counter,x(i));

end

end

end

figure(1)

plot(x,y,'b-',xroot,yroot,'ro','linewidth',2)

grid on;

xlabel('X');

ylabel('Y');

legend('y(x)','Roots')

Pr2)

clc;

clear all;

close all;

x = 0:0.00001:20;

y = (30./(1+x)) + (20\*((x + x.^2)./(1 + 5\*x.^2))) + (40\*sin(x).\*exp((-0.25)\*x));

yAve = mean(y);

counter = 0;

for i = 1:length(x)

if(y(i)<=yAve+0.00002 && y(i)>= yAve-0.00001)

counter = 1 + counter;

yroot(counter) = y(i);

xroot(counter) = x(i);

end

end

figure(2)

plot(x,y,'b-',xroot,yroot,'ro','linewidth',2)

grid on;

xlabel('X');

ylabel('Y');

legend('y(x)','Satisfying points')

title({['X1 = ',num2str(xroot(1)),' X2 = ',num2str(xroot(2)),' X3 = ',num2str(xroot(3))]});

Pr3)

clc;

clear all;

close all;

x = 0:0.0001:26;

b = 3.5:0.001:5;

for i = 1:length(b)

y = 20 + (100\*sin(x/2).\*exp(-0.1\*b(i)\*x))/sqrt(1+b(i));

if(max(y)<=35.00 && max(y)>=34.99)

break

end

end

figure(3)

plot(x,y,'linewidth',2)

grid on;

xlabel('X');

ylabel('Y');

b(i)

Pr4)

clc;

clear all;

close all;

x = 0:0.01:10;

b = 0:0.1:4;

for i = 1:length(b)

counter=0;

y = 15\*cos((2+b(i))\*x).\*exp(-0.2\*x)+10;

yref = y(1);

for j = 2:length(x)

if ((y(j)\*yref) <= 0)

counter = counter + 1;

yref = -yref;

end

end

count(i) = counter;

end

plot(b,count,'b.')

xlabel('b')

ylabel('The number of roots')

grid on

axis equal

Pr5)

clc;

clear all;

close all;

theta = 0:0.0001:2\*pi;

r = [40 30 0 20]';

colors = ['g','y','c','m'];

for R = 1:4

for i = 1:length(theta)

A = [6+R\*sin(theta(i)) 1 1 0;

1 6+R\*cos(theta(i)) 0 1;

1 -1 6-R\*sin(theta(i)) 1;

2 1 -1 6-R\*cos(theta(i))];

M(:,i) = A\r;

deter(i)=det(A);

end

figure(2)

plot(theta,deter,colors(R),'linewidth',1);

xlabel('Theta');

ylabel('Det(A)');

hold on

legend('R=1','R=2','R=3','R=4','Location','SouthEast');

for j = 1:4

figure(1)

subplot(2,2,R);

plot(theta,M(j,:),colors(j),'linewidth',1);

grid on;

hold on;

title(['R = ',num2str(R)]);

xlabel('Theta');

ylabel('X Y Z U');

legend('X','Y','Z','U','Location','SouthEast');

end

end

hold off

hold off

Pr6)

clc;

clear all;

close all;

c = -5:0.0001:5;

r = [6 3 2 1]';

for i = 1:length(c)

A = [5 3 2 1;

-1 c(i) 5 0;

0 1 4 3;

4 1 0 2];

M = A\r;

detA(i) = det(A);

if(det(A)<=0.002 && det(A)>=-0.002)

nonUniq = c(i);

end

end

fprintf('Except c = %.4f, for all the values of c there are unique solution.\n',nonUniq);

fprintf('For c = %.4f there are infinitely many roots.\n',nonUniq);

Pr7)

clc;

clear all;

close all;

X = [1 1 1]';

err = 1;

i = 0;

while err > 0.0001

x = X(1); y = X(2); z = X(3);

F = [(3\*x^2 - 2\*x\*y + z^3 -3);

(6\*x + 3\*y^2 - 2\*x\*y\*z - 6);

(2\*x\*z + y^2 - x\*y\*z^2 - 2)];

J = [6\*x-2\*y -2\*x 3\*z^2;

6-2\*y\*z 6\*y-2\*x\*z -2\*x\*y;

2\*z-y\*z^2 2\*y-x\*z^2 2\*x-2\*x\*y\*z];

Xnew = X - J\F;

err = norm(Xnew-X);

X = Xnew;

x = X(1); y = X(2); z = X(3);

i = i+1;

fprintf('At step%3.0f x = %3.4f y = %3.4f z = %3.4f err = %3.4f \n',i,x,y,z,err)

end

Pr8)

clc;

clear all;

close all;

X = [2 3]';

err = 1;

i = 0;

while err > 0.0001

x = X(1); y = X(2);

F = [(exp(-x)\*y + y^2\*x - 20);

(x^2\*y - y\*exp(-x) - 10)];

J = [-exp(-x)\*y+y^2 exp(-x)+2\*x\*y

2\*x\*y+exp(-x)\*y x^2-exp(-x)];

Xnew = X - J\F;

err = norm(Xnew-X);

X = Xnew;

x = X(1); y = X(2);

i = i+1;

fprintf('At step%3.0f x = %3.4f y = %3.4f err = %3.4f \n',i,x,y,err)

end

Pr9)

clc;

clear all;

close all;

X = [1 0]';

b = 0:0.0001:1;

for j = 1:length(b)

err = 1;

i = 0;

while err > 0.0001

x = X(1); y = X(2);

F = [((5+b(j))\*x^2-x\*y/(2+b(j))-4);

(4\*x\*y + b(j)\*x + y - 1)];

J = [2\*x\*(5+b(j))-(1/(2+b(j)))\*y -(1/(2+b(j)))\*x;

4\*y+b(j) 4\*x+1];

Xnew = X - J\F;

err = norm(Xnew-X);

X = Xnew;

x = X(1); y = X(2);

i = i+1;

end

xroot(j) = x;

yroot(j) = y;

end

figure(9)

plot(b,xroot,'m-',b,yroot,'g-','linewidth',1)

xlabel('b')

ylabel('X Y')

legend('x','y')

grid on