% 2.(1)

a = [-1,1,0;-4,3,0;1,0,2];

b = [1,1,1]';

x = -0.5:0.02:1.5;

pbj = [];

for omega = x

k = eye(3) - omega \* a;

pbj = [pbj, max(abs(eig(k)))];

end

fprintf("omega取值范围\n")

x(pbj<1)

fprintf("谱半径最小时的omega\n")

x(find(pbj==min(pbj)))

plot(x, pbj)

hold on

plot(x, ones(size(x)))



omega取值范围

ans =

列 1 至 17

0.0200 0.0400 0.0600 0.0800 0.1000 0.1200 0.1400 0.1600 0.1800 0.2000 0.2200 0.2400 0.2600 0.2800 0.3000 0.3200 0.3400

列 18 至 34

0.3600 0.3800 0.4000 0.4200 0.4400 0.4600 0.4800 0.5000 0.5200 0.5400 0.5600 0.5800 0.6000 0.6200 0.6400 0.6600 0.6800

列 35 至 49

0.7000 0.7200 0.7400 0.7600 0.7800 0.8000 0.8200 0.8400 0.8600 0.8800 0.9000 0.9200 0.9400 0.9600 0.9800

谱半径最小时的omega

ans =

0.6600

% 2.(3)

clear;clc;

a = [-1,1,0;-4,3,0;1,0,2];

b = [1,1,1]';

real\_x = inv(a) \* b;

for omega = [0.5, 0.66, 0.9]

iter\_n = 1:20;

k = eye(3) - omega \* a;

x = [0, 0, 0]';

xn = [];

for i = iter\_n

x = k\*x + omega\*b;

xn = [xn, x];

end

dif = vecnorm(xn - real\_x);

hold on

plot(iter\_n, dif)

end

legend("omega=0.5", "omega=0.66", "omega=0.9")



%

syms x

y = x^2 \* sin(x^2 - x - 2)

fprintf("一阶导数: \n")

y1 = diff(y)

fprintf("二阶导数: \n")

y2 = diff(y1)

x = -2:0.01:2;

plot(x, eval(y), x, eval(y1), x, eval(y2));

legend("y", "y'", "y''")

grid on

axis equal

fprintf("二分法求f的根:\n")

find\_zero(y, -1.5, -0.5, 0.001)

find\_zero(y, -2, -1.5, 0.001)

fprintf("f的极值点:\n")

find\_zero(y1, -0.5, 0.5, 0.001)

find\_zero(y1, -1.5, -0.5, 0.001)

find\_zero(y1, -2, -1.5, 0.001)

fprintf("f的拐点横坐标:\n")

find\_zero(y2, -0.5, 0.5, 0.001)

find\_zero(y2, -1.5, -0.5, 0.001)

find\_zero(y2, -2, -1.5, 0.001)

%

function ret = find\_zero(f, a, b, ep) % 假设f(b)与f(a)异号

syms x;

ya = subs(f, x, a);

m = (a+b)/2;

ym = subs(f, x, m);

if (abs(ym) < ep) % 满足精度要求，返回

ret = m;

return;

end

if (ym > 0 & ya < 0) | (ym < 0 & ya > 0)

ret = find\_zero(f, a, m, ep);

return

else

ret = find\_zero(f, m, b, ep);

return

end

end



y =

-x^2\*sin(- x^2 + x + 2)

一阶导数:

y1 =

x^2\*cos(- x^2 + x + 2)\*(2\*x - 1) - 2\*x\*sin(- x^2 + x + 2)

二阶导数:

y2 =

2\*x^2\*cos(- x^2 + x + 2) - 2\*sin(- x^2 + x + 2) + x^2\*sin(- x^2 + x + 2)\*(2\*x - 1)^2 + 4\*x\*cos(- x^2 + x + 2)\*(2\*x - 1)

二分法求f的根:

ans =

-1

ans =

-1.8220

f的极值点:

ans =

0

ans =

-0.7314

ans =

-1.5326

f的拐点横坐标:

ans =

-0.4742

ans =

-1.2650

ans =

-1.9240