

## 第二章作业

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1.

```
d=linspace(0,2,101);%delta 取0 到 2
pr(0,-1);%画出附近的等高线(0,-1)
[~,g,G] = m(0,-1);
s1=zeros(2,101);
for i=1:101
[s1(:,i),~,~,~]= trust(g,G,d(i)); %计算  $x^*$ 
end
figure;
plot(s1(1,:), s1(2,:)); % $x^*$  的图形
figure;%下面换成 (0,0.5) 作图
pr(0,0.5);
[~,g,G] = m(0,0.5);
s2=zeros(2,101);
for i=1:101
[s2(:,i),~,~,~]= trust(g,G,d(i));
end
figure;
plot(s2(1,:), s2(2,:));
function []=pr(a,b) %该函数用于画出等高线
x = linspace(a-2,a+2,201);
y = linspace(b-2,b+2,201);
[X,Y] = meshgrid(x,y);
[f,g,G] = m(a,b);
Z = f+g(1).*X+g(2).*Y+1/2*(G(1,1).*X.^2+G(2,2).*Y.^2+2*G(1,2).*X.*Y);
contour(X,Y,Z);
```

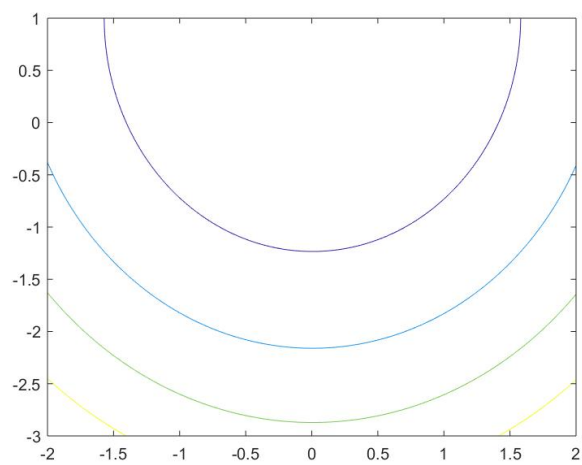


Figure 1: (0,-1)附近的等高线图

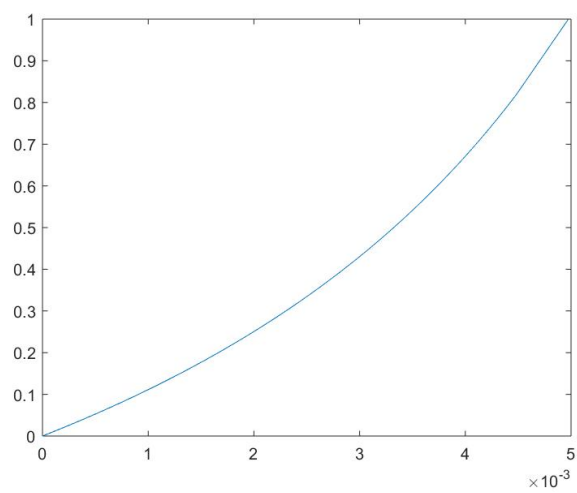


Figure 2: (0,-1)附近的 $x^*$ 图

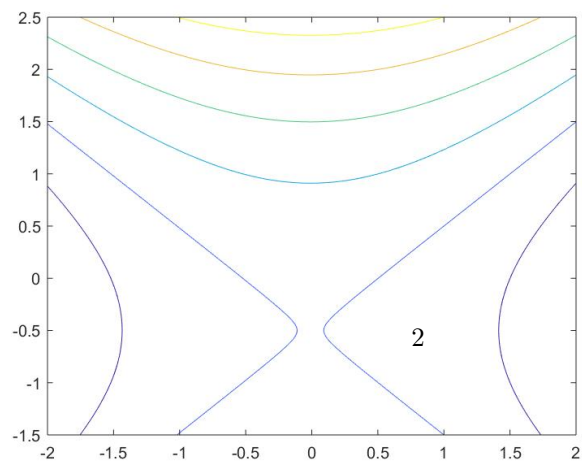


Figure 3: (0,0.5)附近的等高线图

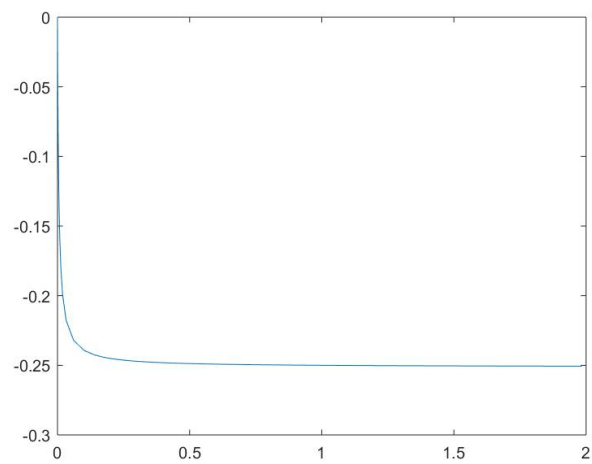


Figure 4:  $(0,0.5)$ 附近的 $x^*$ 图

2.

```
deltah=1; %最大半径
x0=[2,0]'; %初始点
delta0=0.2; %初始半径
eta=0.001; %最小预测比
eps=10−15; %精度
i=0;%记录迭代次数
x=x0;
delta=delta0;
[~,g,G]=m(x(1),x(2));
while norm(g)>eps
    [~,g,G]=m(x(1),x(2));
    p=dogleg(g,G,delta);
    rho=(Rosenbrock(x)−Rosenbrock(x+p))/(−g'*p−1/2*p'*G*p);
    if rho<1/4
        delta=1/4*delta;
    else
        if rho>3/4 && norm(p)==delta
            delta=min(2*delta,deltah);
        end
    end
    if rho>eta
        x=x+p;
    end
    i=i+1;
end
```

输出结果为x=(1,1)，迭代次数11次，用时0.017s

```

deltah=1; %最大半径
x0=[2,0]'; %初始点
delta0=0.2; %初始半径
eta=0.001; %最小预测比
eps=10−15; %精度
i=0; %记录迭代次数
x=x0;
delta=delta0;
[~,g,G]=m(x(1),x(2));
while norm(g)>eps
    [~,g,G]=m(x(1),x(2));
    [p,~,~,~]=trust(g,G,delta);
    rho=(Rosenbrock(x)−Rosenbrock(x+p))/(−g'*p−1/2*p'*G*p);
    if rho<1/4
        delta=1/4*delta;
    else
        if rho>3/4 && norm(p)==delta
            delta=min(2*delta,deltah);
        end
    end
    if rho>eta
        x=x+p;
    end
    i=i+1;
end

```

输出结果为 $x=(1,1)$ ，迭代次数12次，用时0.041s