```matlab
%  Optimization in 2D

f=inline('1.3-exp(-(x-1).^2)-sin(4*x)')
[xx,fxx,flag]=fminbnd(f,1,3)
 x=0:0.001:3;
 subplot(2,1,1)
 plot(x,feval(f,x),xx,fxx,'o')
 [xx,fxx,flag]=fminbnd(f,0,1)
 subplot(2,1,2)
 plot(x,feval(f,x),xx,fxx,'o')
```
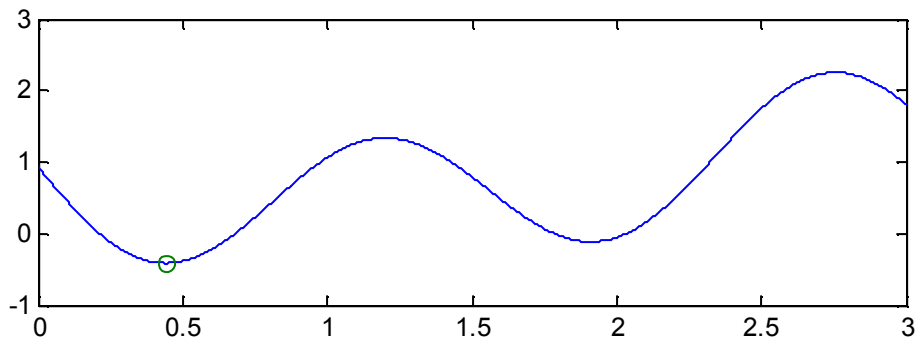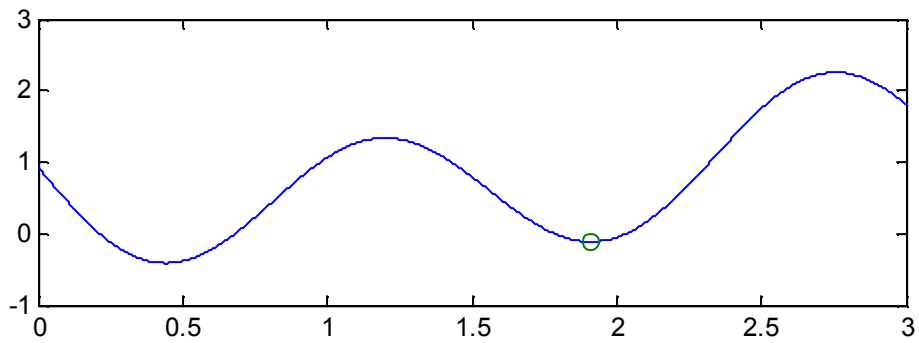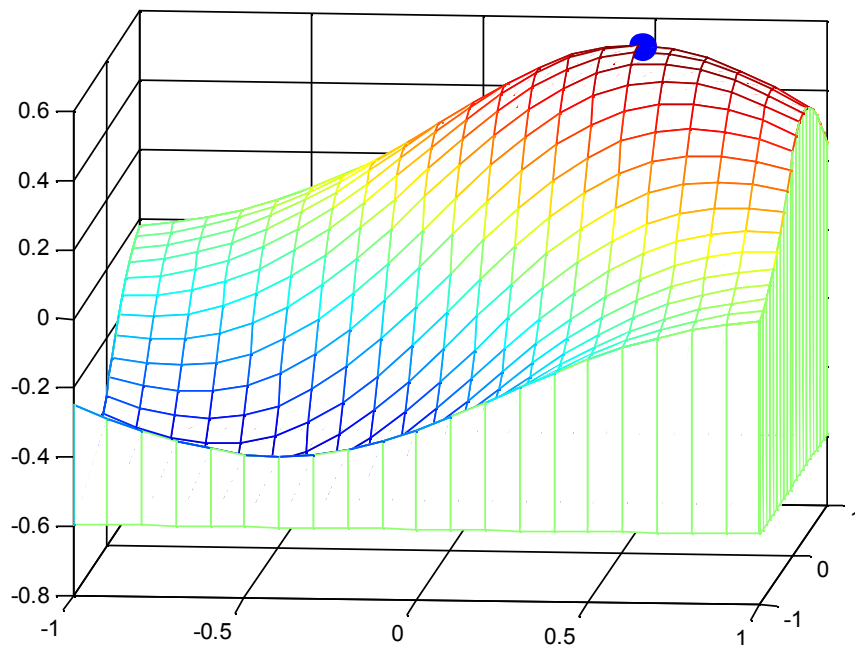
```
%  Minimization 3D

x=.8; y=.2;
 F=(x+sin(y))*exp(-(x^2+y^2));
 z=[x y]'; znorm=1; iter=0;
 while znorm>1e-6 & iter < 30
 s=x+sin(y);
 f=[1-2*x*s; cos(y)-2*y*s];
 J=[-4*x-2*sin(y) -2*x*cos(y);
 -2*y -2*x-3*sin(y)-2*y*cos(y)];
 dz=-J\f; z=z+dz;
 znorm=norm(dz,1); iter=iter+1;
 x=z(1); y=z(2);
 F=(x+sin(y))*exp(-(x^2+y^2));
 end
 xg = -1:.1:1;
 yg = -1:.1:1;
 [xx,yy] = meshgrid(xg,yg);
 zz=(xx+sin(yy)).*exp(-(xx.^2+yy.^2));
 meshz(xx,yy,zz);
 hold on;
 plot3(z(1),z(2),F,'o','LineWidth',6);
 hold off;
```

```matlab
%  Nonlinear fitting
 x=[1 7 10 17 9 12 10 1 16]'; %data
 y=[10 4 12 7 11 3 4 8 5]';
 xc=10; yc=8; a=2; b=3;          %initial guess
 p=[xc yc a b]'; iter=0; dp=1;
 while norm(dp)> 1e-6 & iter<30
 iter=iter+1; xd=x-xc; yd=y-yc;
 f=xd.^2/a^2+yd.^2/b^2-1;
 J=-2*[xd/a^2 yd/b^2 xd.^2/a^3 yd.^2/b^3];
 dp=-J\f; p=p+dp;                %Gauss-Newton
 xc=p(1); yc=p(2); a=p(3); b=p(4);
 end
 t=sprintf('(x- %2.1f)^2/%2.1f^2+(y-
%2.1f)^2/%2.1f^2-1',xc,a,yc,b);
 v=0:2*pi/60:2*pi;
 plot(x,y,'o',xc+a*cos(v),yc+b*sin(v)),
 title(t),
 text(8,7,sprintf('#of iterations = %d',
iter)),
 axis equal;
```


$(x- 9.0)^2/8.6^2+(y- 7.6)^2/4.2^2-1$

#of iterations = 11