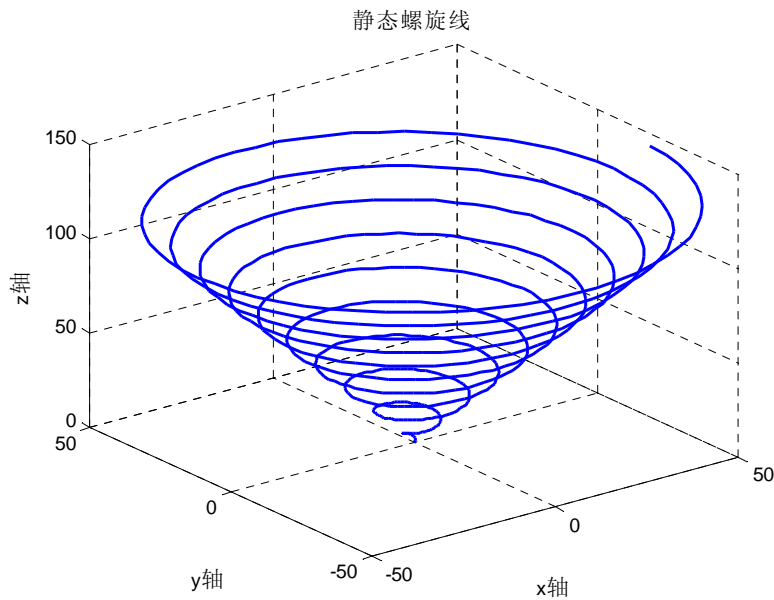


MATLAB 三维绘图的编程实例

一、螺旋线

1. 静态螺旋线

```
a=0:0.1:20*pi;
h=plot3(a.*cos(a), a.*sin(a), 2.*a, 'b', 'linewidth', 2);
axis([-50, 50, -50, 50, 0, 150]);
grid on
set(h, 'erasemode', 'none', 'markersize', 22);
xlabel('x 轴'); ylabel('y 轴'); zlabel('z 轴');
title('静态螺旋线');
```



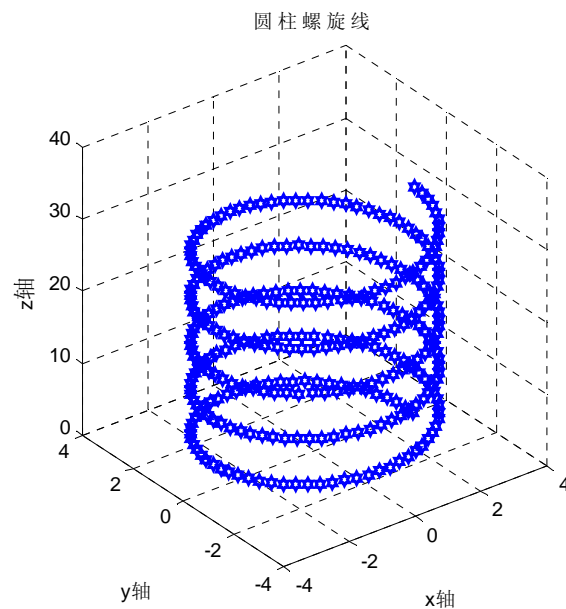
2. 动态螺旋线

```
t=0:0.1:10*pi;
i=1;
h=plot3(sin(t(i)), cos(t(i)), t(i), '*', 'erasemode', 'none');
grid on
axis([-2 2 -2 2 0 35])
for i=2:length(t)
    set(h, 'xdata', sin(t(i)), 'ydata', cos(t(i)), 'zdata', t(i));
    drawnow
    pause(0.01)
end
title('动态螺旋线');
```

(图略)

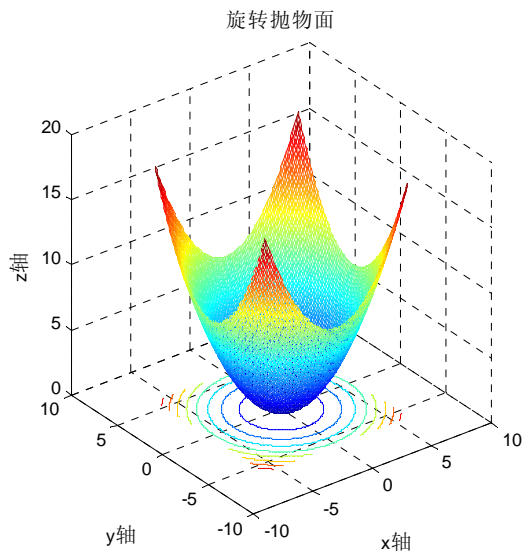
3. 圆柱螺旋线

```
t=0:0.1:10*pi;r=3;
x=r.*cos(t);
y=r.*sin(t);
z=t;
plot3(x,y,z,'h','linewidth',2);
grid on
axis('square')
xlabel('x轴');ylabel('y轴');zlabel('z轴');
title('圆柱螺旋线')
```



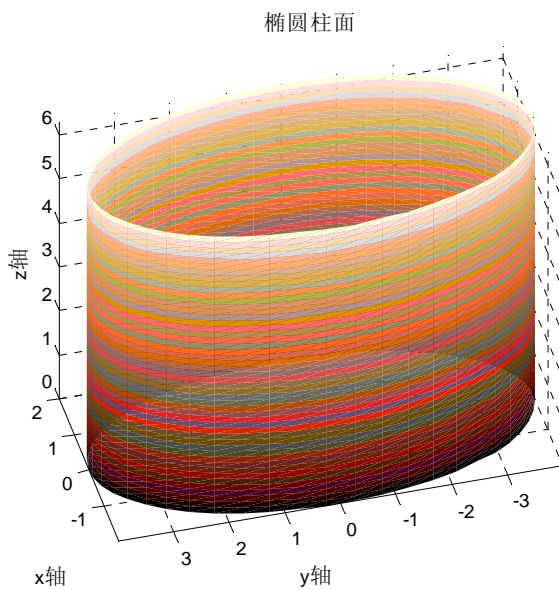
二、旋转抛物面

```
b=0:0.2:2*pi;
[X,Y]=meshgrid(-6:0.1:6);
Z=(X.^2+Y.^2)./4;
meshc(X,Y,Z);
axis('square')
xlabel('x轴');ylabel('y轴');zlabel('z轴');
title('旋转抛物面')
或直接用: ezsurfc(' (X.^2+Y.^2)./4')
```



三、椭圆柱面

```
load clown
ezsurf(' (2*cos(u))', ' 4*sin(u)', ' v', [0, 2*pi, 0, 2*pi])
view(-105, 40)           %视角处理
shading interp           %灯光处理
colormap(map)           %颜色处理
grid on                  %添加网格线
axis equal                %使 x, y 轴比例一致
xlabel(' x 轴');ylabel(' y 轴');zlabel(' z 轴');           %添加坐标轴说明
title(' 椭圆柱面')      %添加标题
```



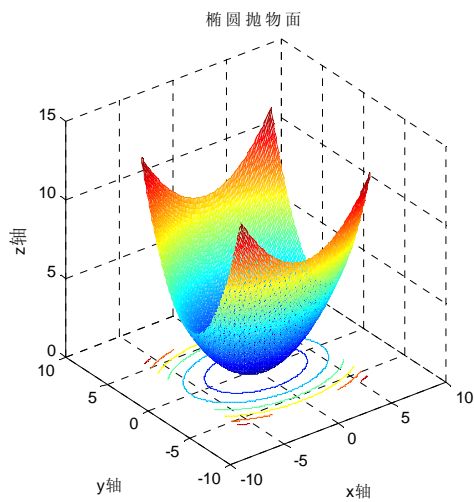
四、椭圆抛物面

```
b=0:0.2:2*pi;
```

```

[X, Y]=meshgrid(-6:0.1:6);
Z=X.^2./9+Y.^2./4;
meshc(X, Y, Z); axis('square')
xlabel('x 轴');ylabel('y 轴');zlabel('z 轴');
title('椭圆抛物面')
或直接用: ezsurf('X.^2./9+Y.^2./4')

```

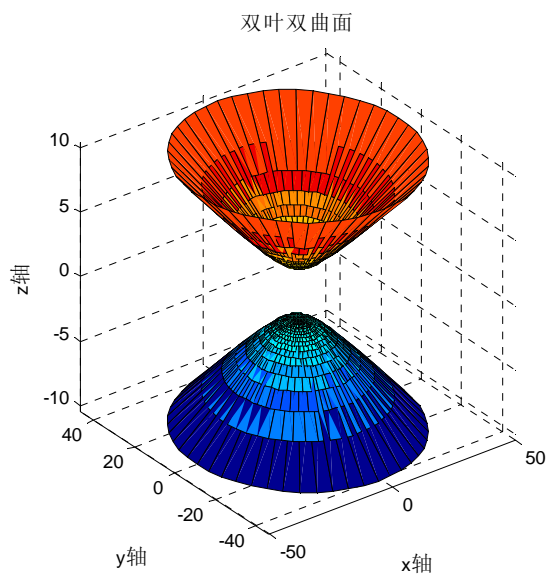


五、'双叶双曲面

```

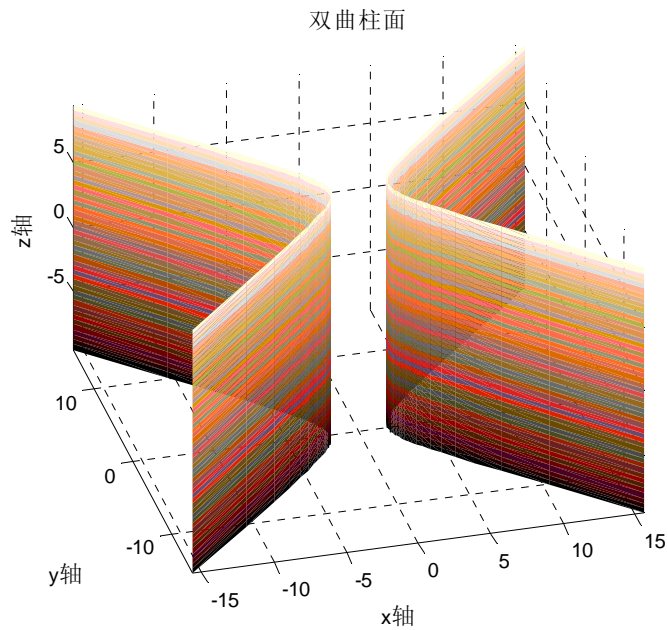
ezsurf('8*tan(u)*cos(v)', '8.*tan(u)*sin(v)', '2.*sec(u)', [-pi./2, 3*pi./2, 0, 2*pi]
)
axis equal; grid on; axis square
xlabel('x 轴');ylabel('y 轴');zlabel('z 轴');
title('双叶双曲面')

```



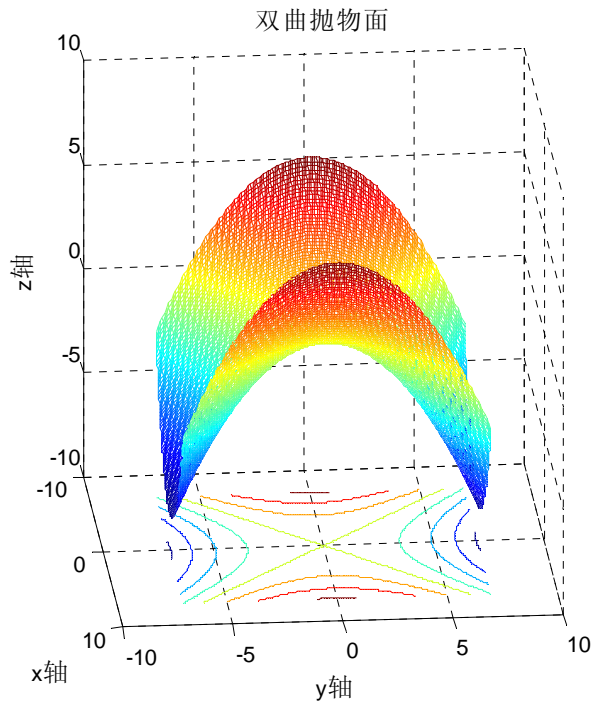
六、双曲柱面

```
load clown
ezsurf('2*sec(u)', '2*tan(u)', 'v', [-pi/2, pi/2, -3*pi, 3*pi])
hold on %在原来的图上继续作图
ezsurf('2*sec(u)', '2*tan(u)', 'v', [pi/2, 3*pi/2, -3*pi, 3*pi])
colormap(map)
shading interp
view(-15, 30)
axis equal
grid on
axis equal
xlabel('x 轴'); ylabel('y 轴'); zlabel('z 轴');
title('双曲柱面')
```



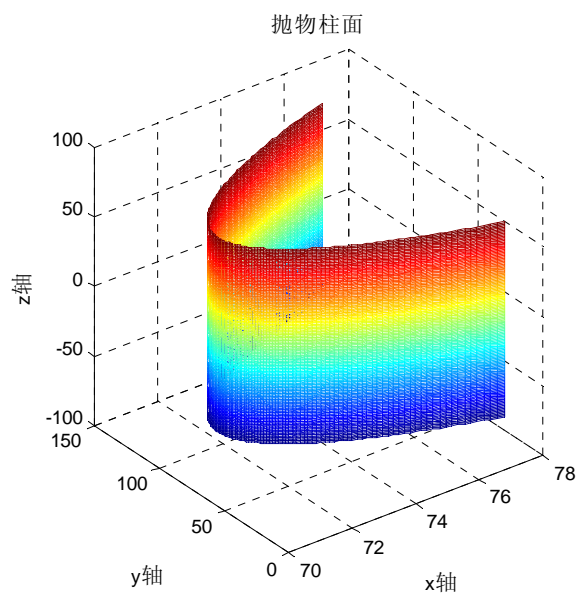
七、双曲抛物面（马鞍面）

```
[X, Y]=meshgrid(-7:0.1:7);
Z=X.^2./8-Y.^2./6;
meshc(X, Y, Z);
view(85, 20)
axis('square')
xlabel('x 轴'); ylabel('y 轴'); zlabel('z 轴');
title('双曲抛物面')
或直接用: ezsurfc('X.^2./8-Y.^2./6')
```



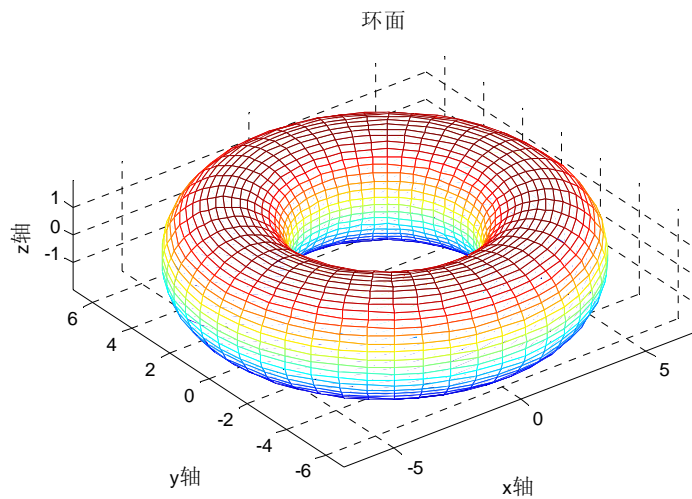
八、抛物柱面

```
[X,Y]=meshgrid(-7:0.1:7);
Z=Y.^2./8; h=mesh(Z);
rotate(h,[1 0 1],180) %旋转处理
axis('square')
xlabel('x轴');ylabel('y轴');zlabel('z轴');
title('抛物柱面')
或直接用: ezsurfc('Y.^2./8')
```



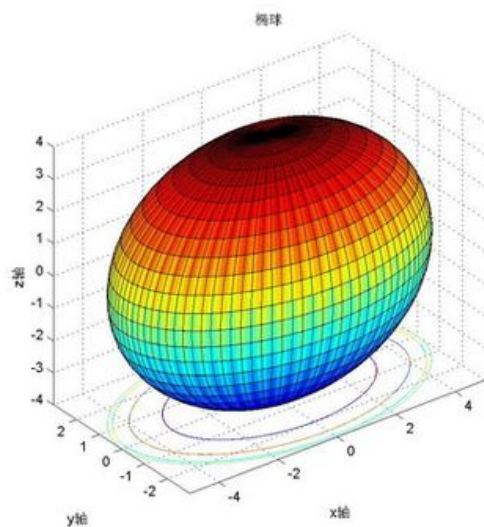
九、环面

```
ezmesh(' (5+2*cos(u))*cos(v)', ' (5+2*cos(u))*sin(v)', ' 2*sin(u)', [0, 2*pi, 0, 2*pi])  
axis equal  
grid on  
xlabel(' x 轴');ylabel(' y 轴');zlabel(' z 轴');  
title(' 环面')
```



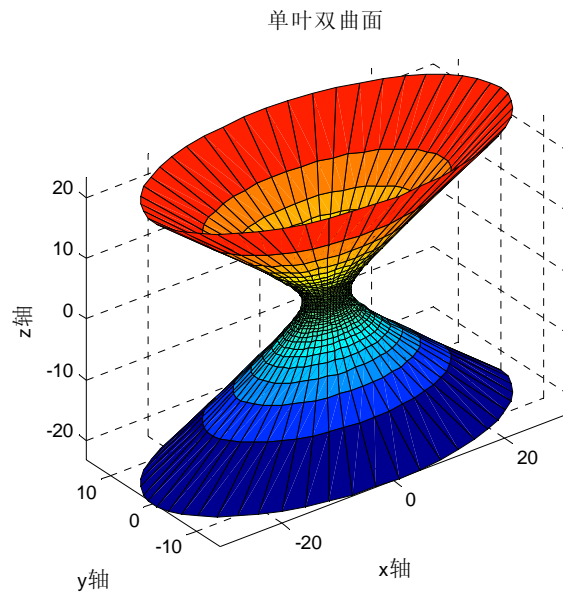
十、椭球

```
ezsurf(' (5*cos(u))*sin(v)', ' (3*sin(u))*sin(v)', ' 4*cos(v)', [0, 2*pi, 0, 2*pi])  
axis equal; grid on  
xlabel(' x 轴');ylabel(' y 轴');zlabel(' z 轴');  
title(' 椭球')
```



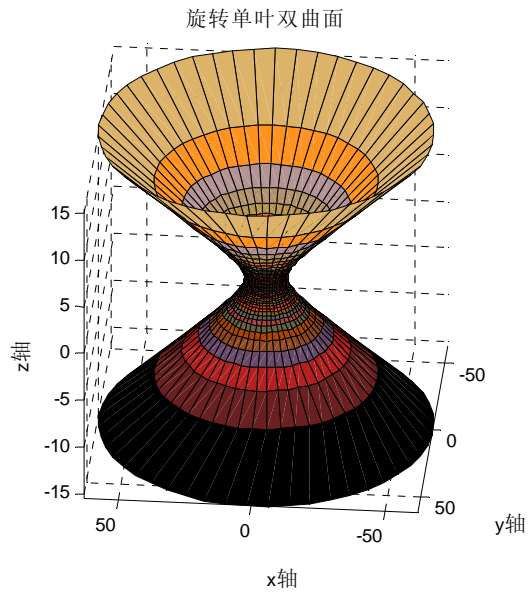
十一、单叶双曲面

```
ezsurf('4*sec(u)*cos(v)', '2.*sec(u)*sin(v)', '3.*tan(u)', [-pi./2, pi./2, 0, 2*pi])  
axis equal  
grid on  
xlabel('x 轴'); ylabel('y 轴'); zlabel('z 轴');  
title('单叶双曲面')
```



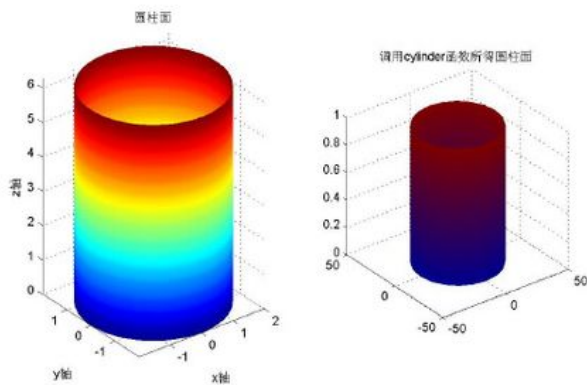
十二、旋转单叶双曲面

```
load clown  
ezsurf('8*sec(u)*cos(v)', '8.*sec(u)*sin(v)', '2.*tan(u)', [-pi./2, pi./2, 0, 2*pi])  
colormap(map)  
view(-175, 30)  
%alpha(.2) %透明处理  
axis equal  
grid on  
axis square  
xlabel('x 轴'); ylabel('y 轴'); zlabel('z 轴');  
title('旋转单叶双曲面')
```

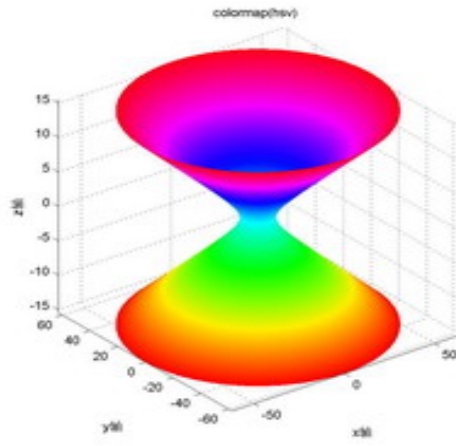
十三、圆柱面

```
subplot(1,2,1)
ezsurf('2*cos(u)', '2*sin(u)', 'v', [0, 2*pi, 0, 2*pi])
grid on
shading interp
axis equal
xlabel('x轴');ylabel('y轴');zlabel('z轴');
title('圆柱面')
subplot(1,2,2)
cylinder(30)
shading interp
axis square
title('调用cylinder函数所得圆柱面')
```

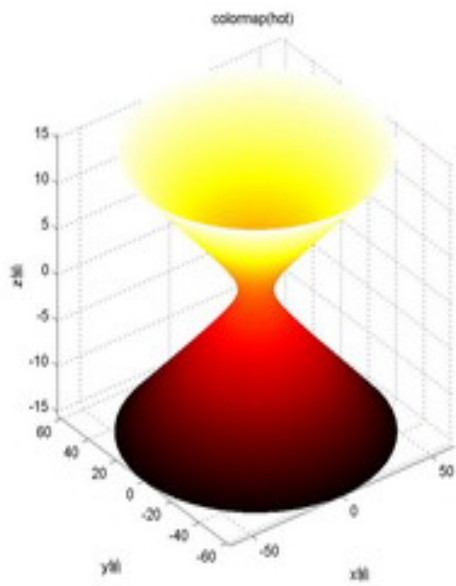


下面给出用 colormap() 改变图像颜色的例子:(用了灯光效果"shading interp")

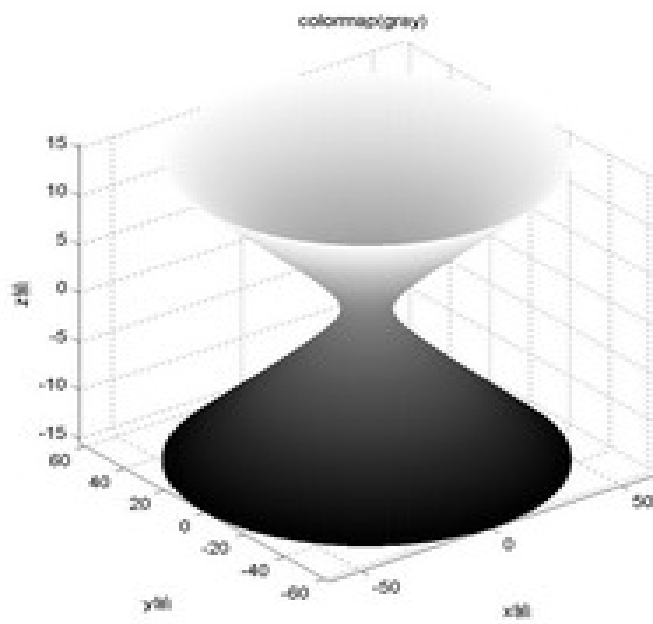
```
colormap(); %hot/cool/copper/gray/hsv/spring/summer/winter...
```



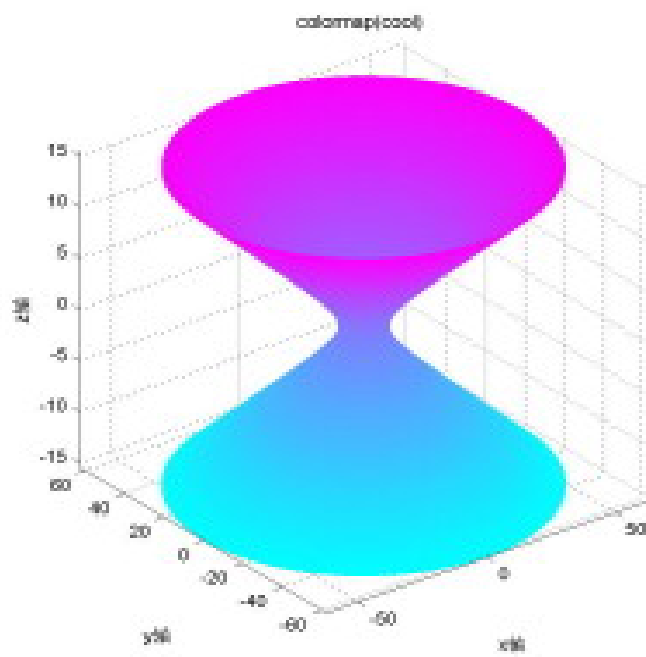
colormap(hsv)



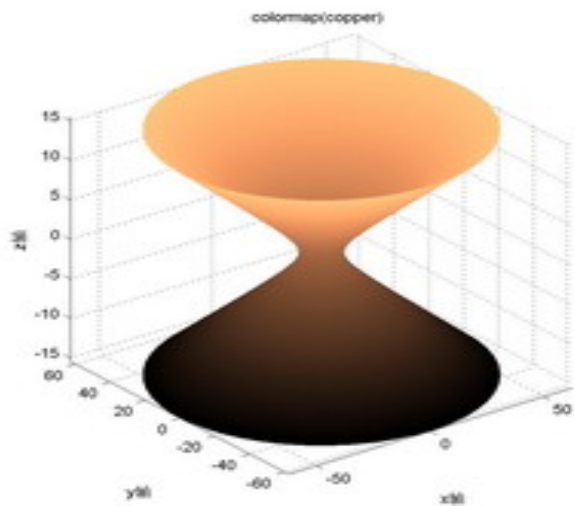
colormap(hot)



colormap(gray)



colormap(cool)



colormap(copper)

下面做了旋转 (“view([])”）、灯光 (“shading interp”)、透明 (“alpha()”) 处理：

