Q1：

```
>> syms   k h(k) x(k) y(k) n a b

>> syms   z F(z)

>> assume(k,'integer'); assumeAlso(k,'positive')

>> assume(a~=b)

>> x(k)=a^k; h(k)=b^k;
```

% 用直接法

```
>>y(k)=symsum(h(n)*x(k-n),n,0,k); simplify(y)

ans(k) =

(a^(k + 1) - b^(k + 1))/(a - b)
```

% 用 z 变换方法

```
>>y(k)=iztrans(ztrans(x(k),k,z)*ztrans(h(k),k,z),z,k); simplify(y)

ans(k) =

(a^(k + 1) - b^(k + 1))/(a - b)
```

Q2：

```
>> syms   t f(t) s
```

% Laplace 变换的时域求导性质

```
>> logical(laplace(diff(f),t,s)==s*laplace(f(t), t, s) - f(0))

ans =

1
```

Q3：

```
>> S=solve(x^2+y^2==1,x*y==2,x,y);
>> for k=1:4
disp(['解',int2str(k)])
disp(['x=',char(simplify(S.x(k)))])
disp(['y=',char(simplify(S.y(k)))])
end
```

% 按组别输出所有解

解 1

x=- (3^(1/2)*1i)/2 - 5^(1/2)/2

y=(3^(1/2)*1i)/2 - 5^(1/2)/2

解 2

x=(3^(1/2)*1i)/2 - 5^(1/2)/2

y=- (3^(1/2)*1i)/2 - 5^(1/2)/2

解 3

x=(3^(1/2)*1i)/2 + 5^(1/2)/2

y=5^(1/2)/2 - (3^(1/2)*1i)/2

解 4

x=5^(1/2)/2 - (3^(1/2)*1i)/2

y=(3^(1/2)*1i)/2 + 5^(1/2)/2

Q4：

```
>> ezmesh('cos(s)*sin(t)','sin(s)*sin(t)','cos(t)',[0,pi,0,pi/6])

>> colormap(spring)

>> view(303,13)
```


x = cos(s) sin(t), y = sin(s) sin(t), z = cos(t)
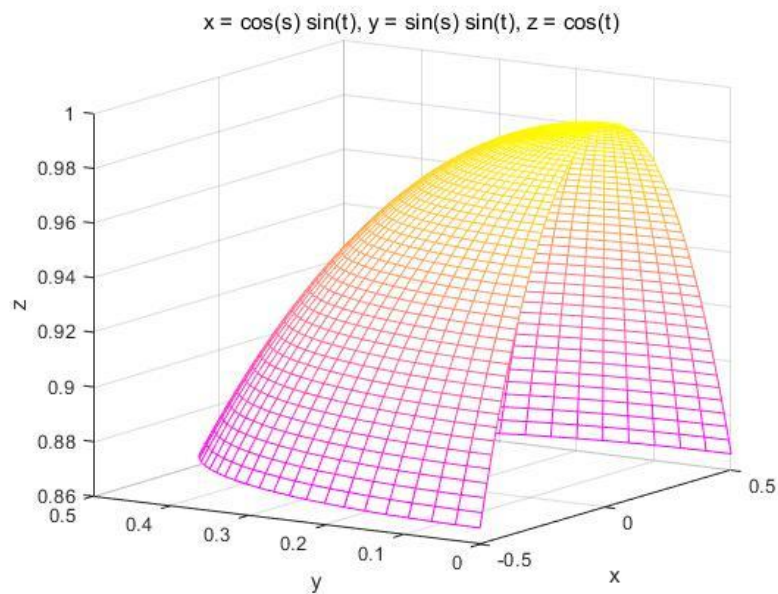
```
>> ezsurf('cos(s)*sin(t)','sin(s)*sin(t)','cos(t)',[0,pi,0,pi/6])

>> shading interp

>> view(303,13)
```


x = cos(s) sin(t), y = sin(s) sin(t), z = cos(t)
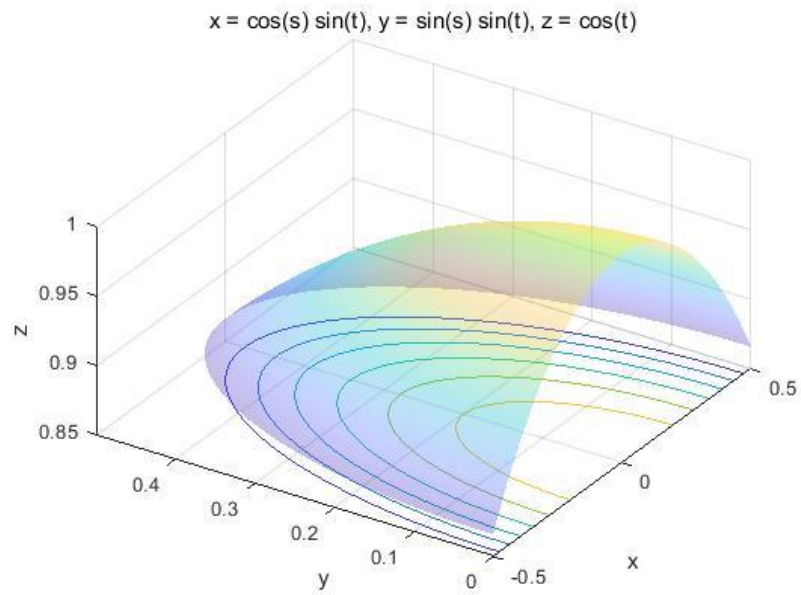
>> ezsurfc('cos(s)*sin(t)','sin(s)*sin(t)','cos(t)',[0,pi,0,pi/6])

>> shading interp

>> view(303,47)

>> alpha(0.3)

$x = \cos(s)\sin(t), y = \sin(s)\sin(t), z = \cos(t)$

Q5（选做）：

1）截自百度百科双曲抛物面词条

如果把双曲抛物面

$$z = \frac{x^2}{a^2} - \frac{y^2}{b^2}.$$

顺着+z的方向旋转π/4的角度，则方程为：

$$z = \frac{1}{2}(x^2 + y^2)\left(\frac{1}{a^2} - \frac{1}{b^2}\right) + xy\left(\frac{1}{a^2} + \frac{1}{b^2}\right).$$

如果 $a = b$ ，则简化为：

$$z = \frac{2}{a^2}xy.$$

最后，设 $a = \sqrt{2}$ ，我们可以看到双曲抛物面

$$z = \frac{x^2 - y^2}{2}.$$

与以下的曲面是全等的：

$$z = xy.$$

所以，z=xy 是双曲抛物面

所以，x^2-2xy+2y+z^2=4 是单叶双曲面

2）曲面还有以下类型：

i)球面，如：x^2+y^2+z^2=1

ii)圆锥面，如：x^2+y^2= z^2

iii)椭圆锥面，如：x^2+y^2/4=z^2

iv)椭球面，如：x^2+y^2+z^2/4=1

v)椭圆抛物面，如：x^2+y^2=z

vi)双叶双曲面，如：x^2-y^2-z^2=1
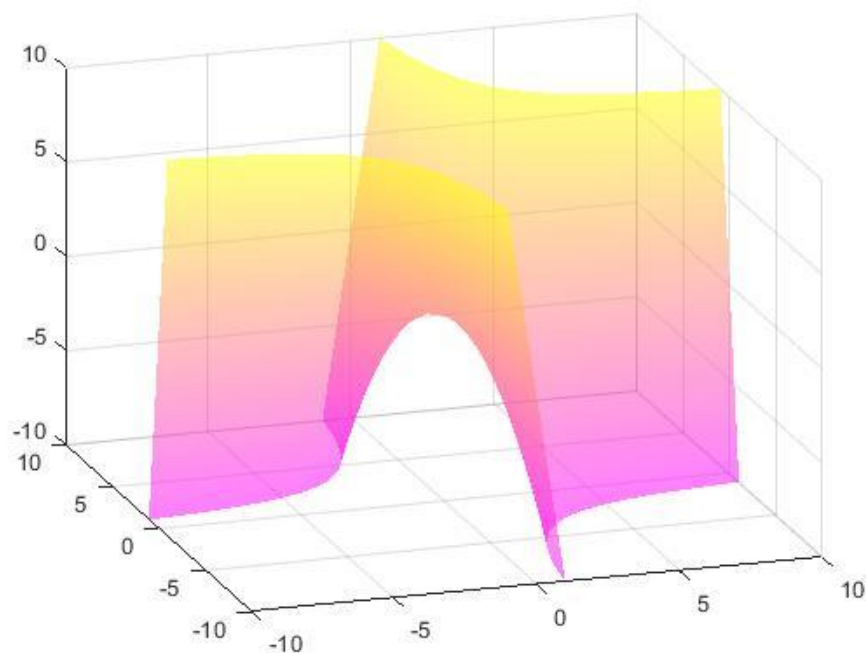
3）双曲抛物面：

```
>> f = @(x,y,z) z-x.*y;
>> interval = [-10 10 -10 10 -10 10];
>> fimplicit3(f,interval,'EdgeColor','none','FaceAlpha',.5)
>> view(-18,25)
```
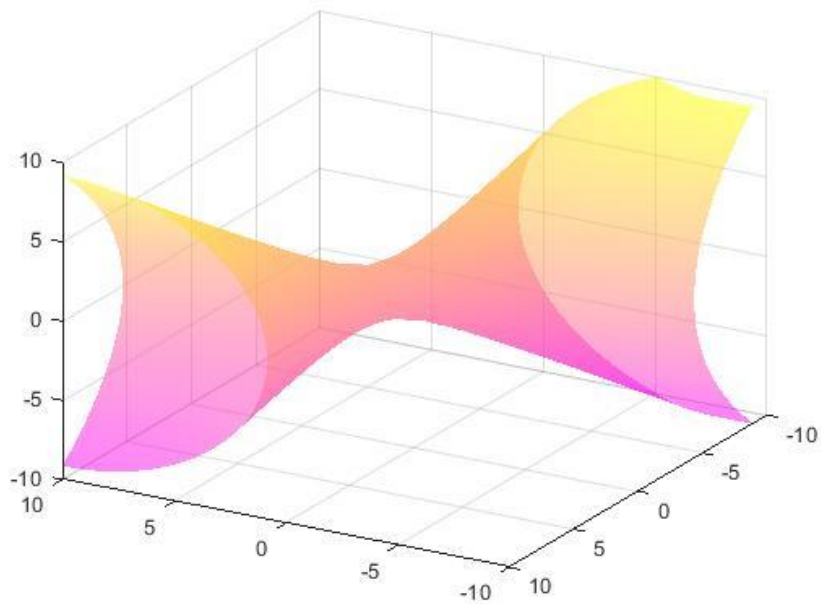
单叶双曲面：

>> f = @(x,y,z) x.^2-2.*x.*y+2.*y+z.^2-4;

>> interval = [-10 10 -10 10 -10 10];

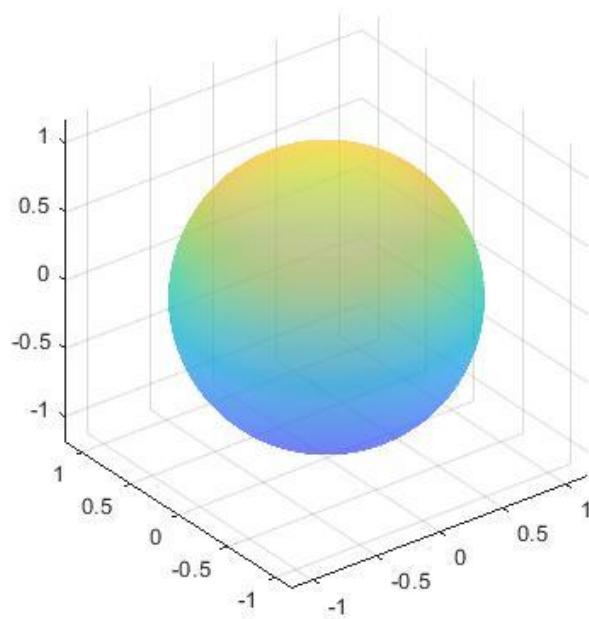>> fimplicit3(f,interval,'EdgeColor','none','FaceAlpha',.5)

>> view(-150,29)

球面：

>> f = @(x,y,z) x.^2+y.^2+z.^2-1;

>> interval = [-10 10 -10 10 -10 10];

>> fimplicit3(f,interval,'EdgeColor','none','FaceAlpha',.5)

>> axis equal
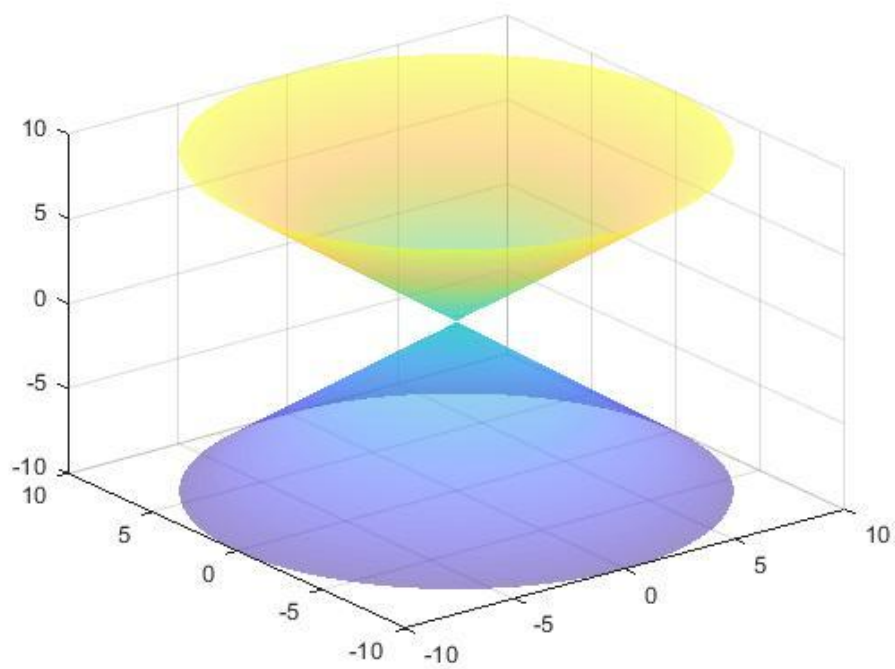
圆锥面：

```
>> f = @(x,y,z) x.^2+y.^2-z.^2;

>> interval = [-10 10 -10 10 -10 10];

>> fimplicit3(f,interval,'EdgeColor','none','FaceAlpha',.5)
```
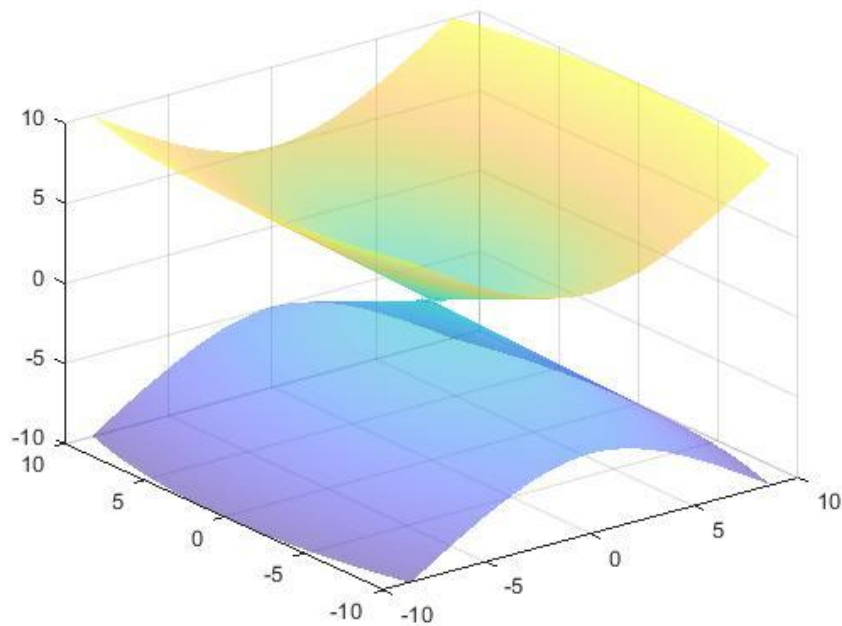
椭圆锥面：

>> f = @(x,y,z) x.^2+y.^2/4-z.^2;

>> interval = [-10 10 -10 10 -10 10];

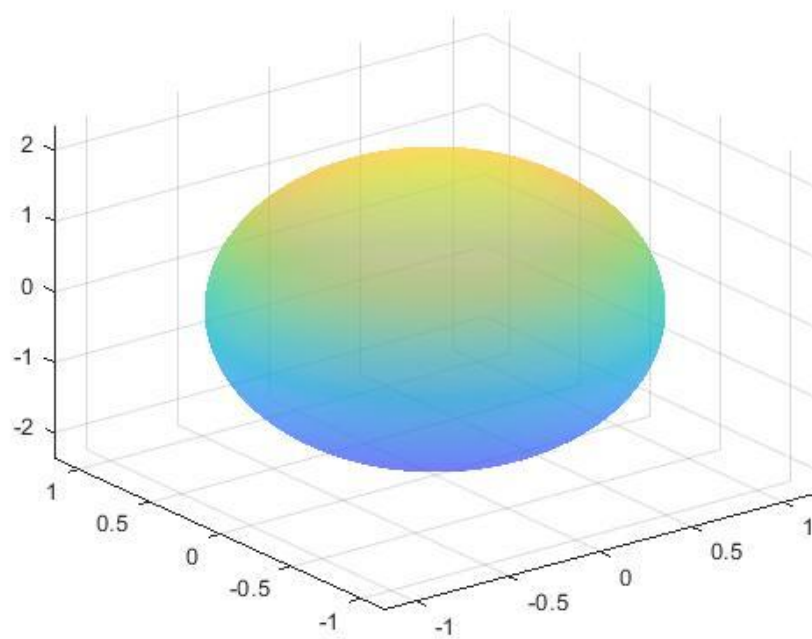>> fimplicit3(f,interval,'EdgeColor','none','FaceAlpha',.5)

椭球面：

>> f = @(x,y,z) x.^2+y.^2+z.^2/4-1;

>> interval = [-10 10 -10 10 -10 10];

>> fimplicit3(f,interval,'EdgeColor','none','FaceAlpha',.5)

椭圆抛物面：

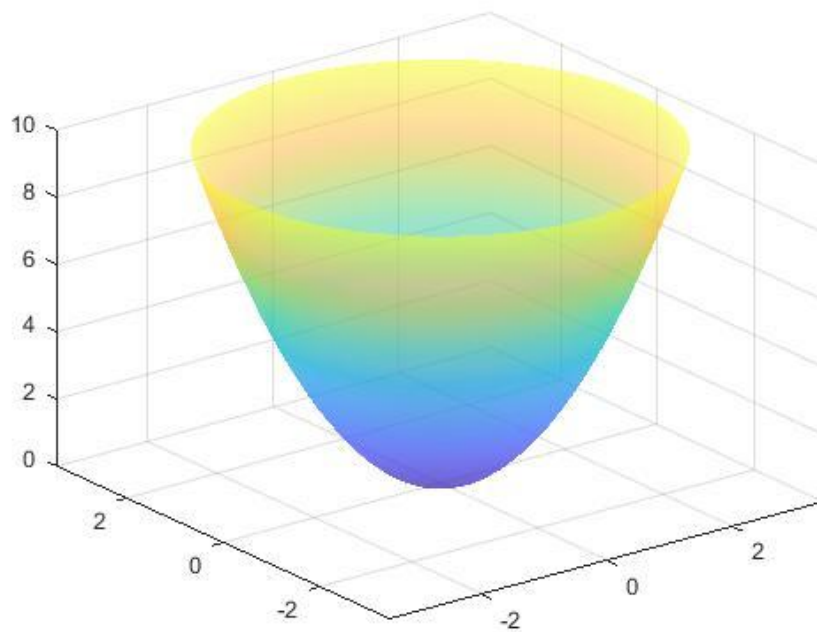>> f = @(x,y,z) x.^2+y.^2-z;

>> interval = [-10 10 -10 10 0 10];

>> fimplicit3(f,interval,'EdgeColor','none','FaceAlpha',.5)

双叶双曲面：

>> f = @(x,y,z) x.^2-y.^2-z.^2-1;

>> interval = [-10 10 -10 10 -10 10];

>> fimplicit3(f,interval,'EdgeColor','none','FaceAlpha',.5)

>> view(-9.3,27.6)