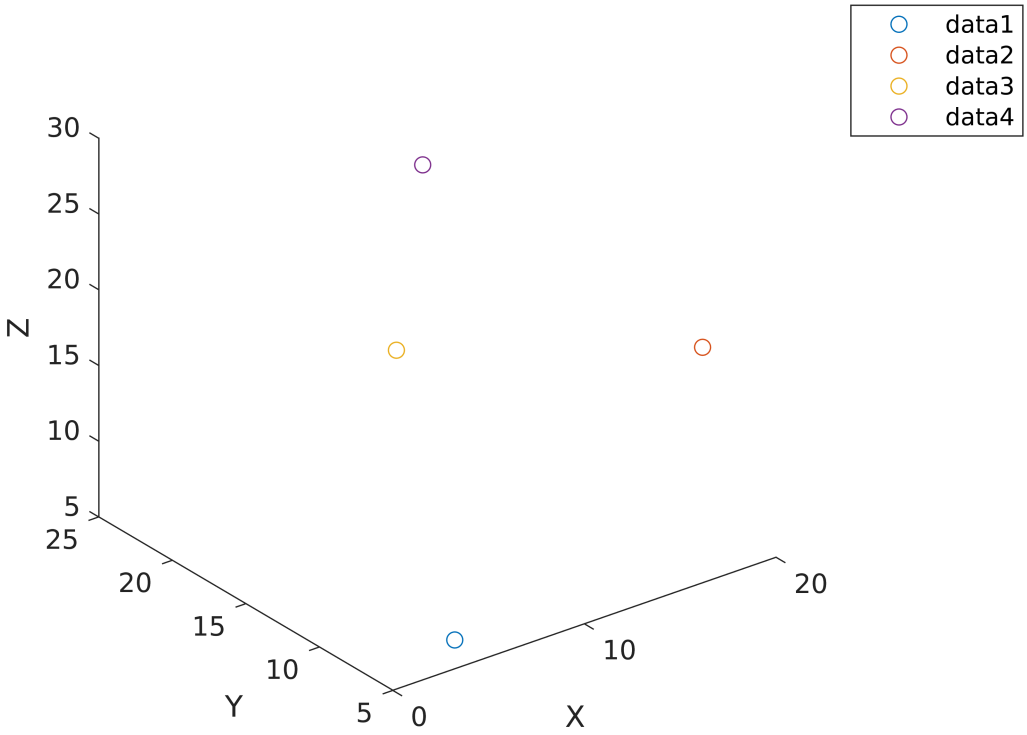
```
a1=4;
a2=6;
a3=6;
b1=20-a1;
b2=10-a2;
b3=16-a3;
c1=14-a1;
c2=23-a2;
c3=11-a3;
d1=10-a1;
d2=16-a2;
d3=29-a3;

a=[4,6,6];
b=[20,10,16];
c=[14,23,11];
d=[10,16,29];

%a=[6,7,6]
%b=[20,11,15]
%c=[15,23,10]
%d=[11,18,24]

%a=a-a
%b=b-a
%c=c-a
%d=d-a
```

Дана пирамидка:

```
figure;
plot3(a(1),a(2),a(3),'o')
hold on
plot3(b(1),b(2),b(3),'o')
plot3(c(1),c(2),c(3),'o')
plot3(d(1),d(2),d(3),'o')
xlabel('X');
ylabel('Y');
zlabel('Z');
legend('show');
hold off
```



С вершинами:

```
a= sym(a)
```

a = (4 6 6)

```
b=sym(b)
```

b = (20 10 16)

```
c=sym(c)
```

c = (14 23 11)

```
d=sym(d)
```

d = (10 16 29)

```
syms ('y',[1,3])
syms ('x',[1,3])
```

Функция плотности:

```
Rho=sum(x)
```

Rho = $x_1 + x_2 + x_3$

```
y;
y = transpose (y);
x = transpose (x);
```

```
y;
```

Матрица отображения из S в W

```
C_S_V=sym([b'-a',c'-a',d'-a'])
```

C_S_V =

$$\begin{pmatrix} 16 & 10 & 6 \\ 4 & 17 & 10 \\ 10 & 5 & 23 \end{pmatrix}$$

```
z=C_S_V*y;
vecY=symvar(z);
```

Сквозное отображение из S в V

```
x=z+a'
```

x =

$$\begin{pmatrix} 16\,y_1 + 10\,y_2 + 6\,y_3 + 4 \\ 4\,y_1 + 17\,y_2 + 10\,y_3 + 6 \\ 10\,y_1 + 5\,y_2 + 23\,y_3 + 6 \end{pmatrix}$$

Якобиан

```
J = det(C_S_V)
```

J = 4636

Функция плотности в V

```
Rho=sum(x)
```

Rho = $30\,y_1 + 32\,y_2 + 39\,y_3 + 16$

Поочередно спроецируем пирамиду на оси и найдем соответствующие координаты точки центра тяжести cxi

$$cx_i = \frac{I_i}{I}$$

$$I = \int_V f(x)\mathrm{dx} = \int_0^1 \mathrm{dy}_1 \int_0^{1-y_1} \mathrm{dy}_2 \int_0^{1-y_1-y_2} \mathrm{Rho}(y_1, y_2, y_3)\mathrm{dy}_3$$

$$I_i = \int_V x_i * f(x)\mathrm{dx} = \int_0^1 \mathrm{dy}_1 \int_0^{1-y_1} \mathrm{dy}_2 \int_0^{1-y_1-y_2} x_i * \mathrm{Rho}(y_1, y_2, y_3)\mathrm{dy}_3$$

```
I1=int(Rho,y3,0,1-y(1)-y(2));
I2=int(I1,y(2),0,1-y(1));
I3=int(I2,y(1),0,1);
I=I3
```

```
I =
```

$$\frac{55}{8}$$

```
double(I)
```

```
ans = 6.8750
```

```
I1=int(x(1)*Rho,y3,0,1-y(1)-y(2));
I2=int(I1,y(2),0,1-y(1));
I3=int(I2,y(1),0,1);
I1=I3
```

```
I1 =
```

$$\frac{5063}{60}$$

```
double(I3)
```

```
ans = 84.3833
```

```
cx1=I3/I
```

```
cx1 =
```

$$\frac{10126}{825}$$

```
double(cx1)
```

```
ans = 12.2739
```

```
I1=int(x(2)*Rho,y3,0,1-y(1)-y(2));
I2=int(I1,y(2),0,1-y(1));
I3=int(I2,y(1),0,1);
I2=I3
```

```
I2 =
```

$$\frac{2323}{24}$$

```
double(I3)
```

```
ans = 96.7917
```

```
cx2=I3/I
```

```
cx2 =
```

$$\frac{2323}{165}$$

```
double(cx2)
```

```
ans = 14.0788
```

```
I1=int(x(3)*Rho,y3,0,1-y(1)-y(2));
I2=int(I1,y(2),0,1-y(1));
I3=int(I2,y(1),0,1)
```

```
I3 =
```

$$\frac{879}{8}$$

```
double(I3)
```

```
ans = 109.8750
```

```
cx3=I3/I
```

```
cx3 =
```

$$\frac{879}{55}$$

```
double(cx3)
```

```
ans = 15.9818
```

```
xc=[cx1,cx2,cx3]
```

```
xc =
```

$$\left(\frac{10126}{825} \quad \frac{2323}{165} \quad \frac{879}{55}\right)$$

```
xc = double ([cx1,cx2,cx3])
```

```
xc = 1×3
   12.2739   14.0788   15.9818
```

Нарисуем все вместе

```
figure;
plot3(a(1),a(2),a(3),'or')
hold on
plot3(b(1),b(2),b(3),'or')
```

```
plot3(c(1),c(2),c(3),'or')
plot3(d(1),d(2),d(3),'or')
plot3(xc(1),xc(2),xc(3),'xg')

xlabel('X');
ylabel('Y');
zlabel('Z');
legend('show');
hold off
```