Práctica 8 - Cámaras

Ejercicio 1

```
R1 = rotateZ(90) * rotateY(90)
```

```
R1 = 3×3
    0.0000   -1.0000    0.0000
    0.0000    0.0000    1.0000
   -1.0000         0    0.0000
```

```
R2 = rotateZ(90) * rotateX(90)
```

```
R2 = 3×3
    0.0000   -0.0000    1.0000
    1.0000    0.0000   -0.0000
         0    1.0000    0.0000
```

```
R3 = rotateZ(30) * rotateY(90) * rotateX(45)
```

```
R3 = 3×3
    0.0000    0.2588    0.9659
    0.0000    0.9659   -0.2588
   -1.0000    0.0000    0.0000
```

Notar que aplicamos las rotaciones en el orden especificado (ZYX). Cuando no es necesario rotar en algún eje, se multiplica por la matriz identidad.

Ejercicio 2

```
X = [3 4 -3]
```

```
X = 1×3
     3     4    -3
```

```
C = [5 3 5]
```

```
C = 1×3
     5     3     5
```

```
R = rotateY(90)
```

```
R = 3×3
    0.0000         0    1.0000
         0    1.0000         0
   -1.0000         0    0.0000
```

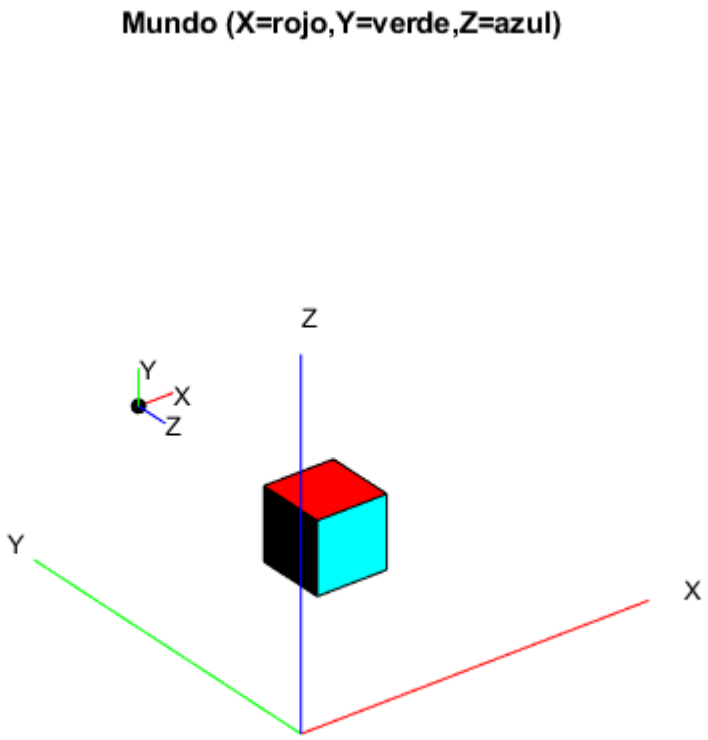
```
X_cam = R * (X-C)'
```

```
X_cam = 3×1
   -8.0000
```

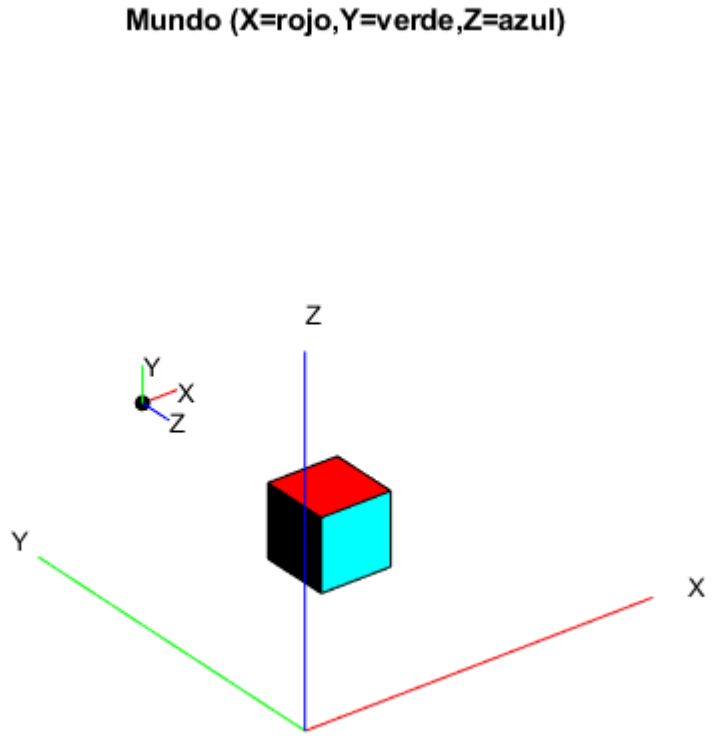
```
1.0000
2.0000
```

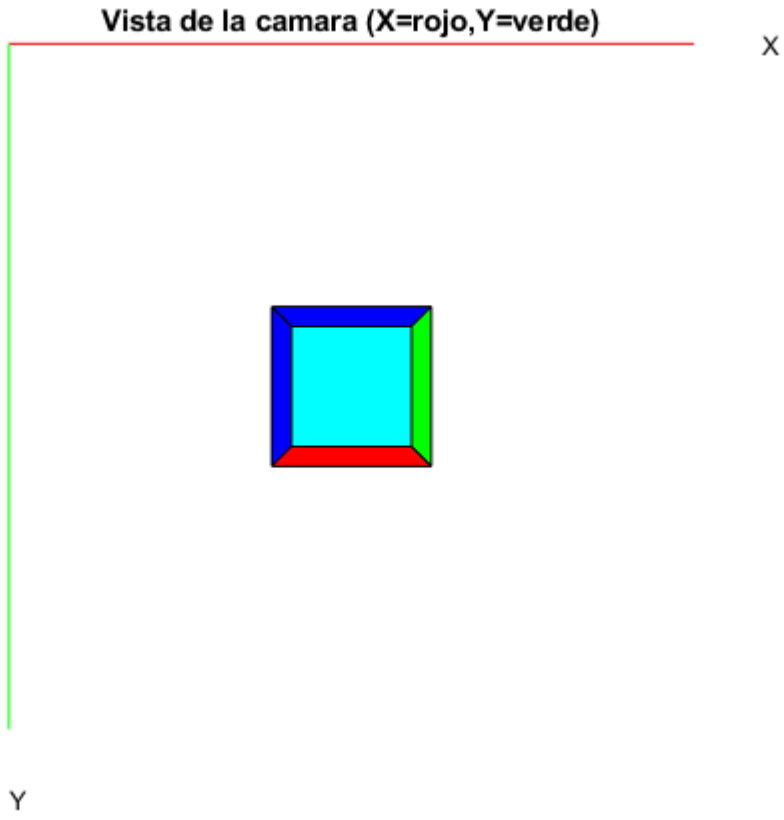
Ejercicio 3

```
f = 0.1;
s = 0;
px = 0.5; py = 0.5;
theta_x = pi/2; %-3*pi/4;
theta_y = 0;
theta_z = 0; %pi/4;%0;
C = [3 10 3]'; % enfrentado

generar_camara(f, s, px, py, theta_x, theta_y, theta_z, C)
```



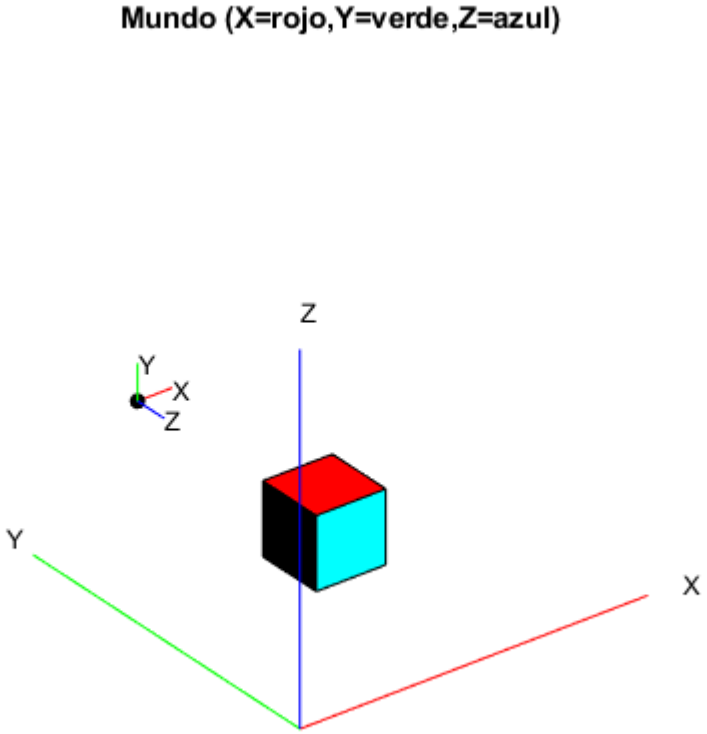

```
f = 0.7;
s = 0;
px = 0.5; py = 0.5;
theta_x = pi/2; %-3*pi/4;
theta_y = 0;
theta_z = 0; %pi/4;%0;
C = [3 10 3]'; % enfrentado

generar_camara(f, s, px, py, theta_x, theta_y, theta_z, C)
```

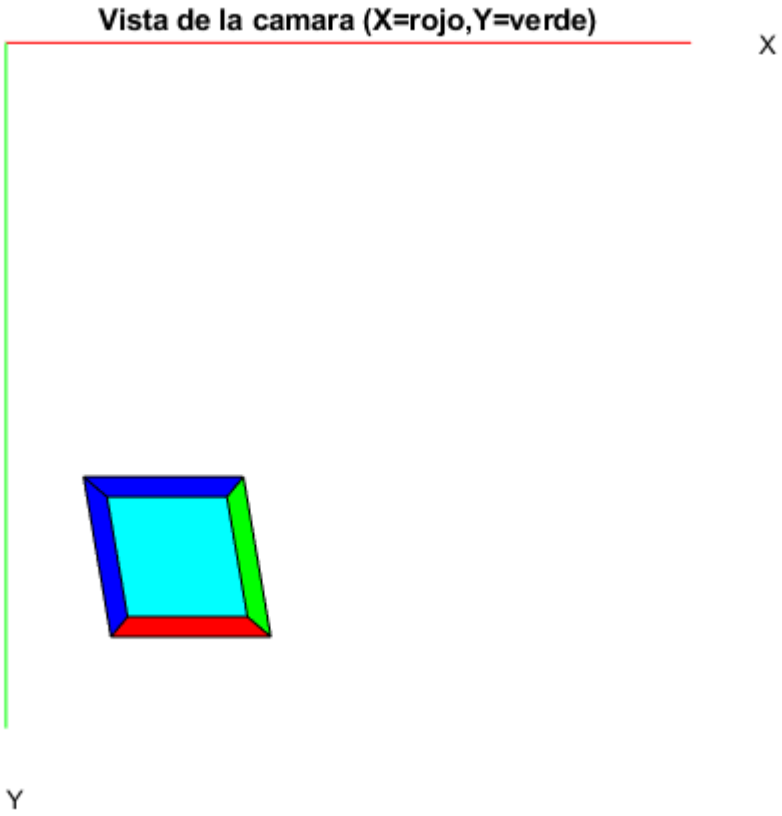




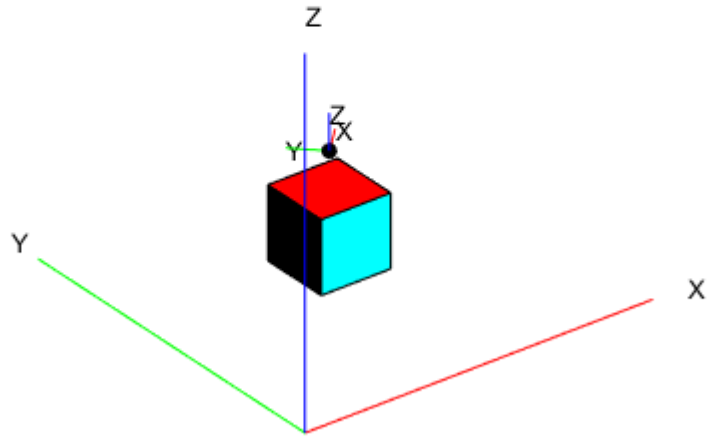

```
f = 0.7;
s = 0.12;
px = 0.25; py = 0.75;
```

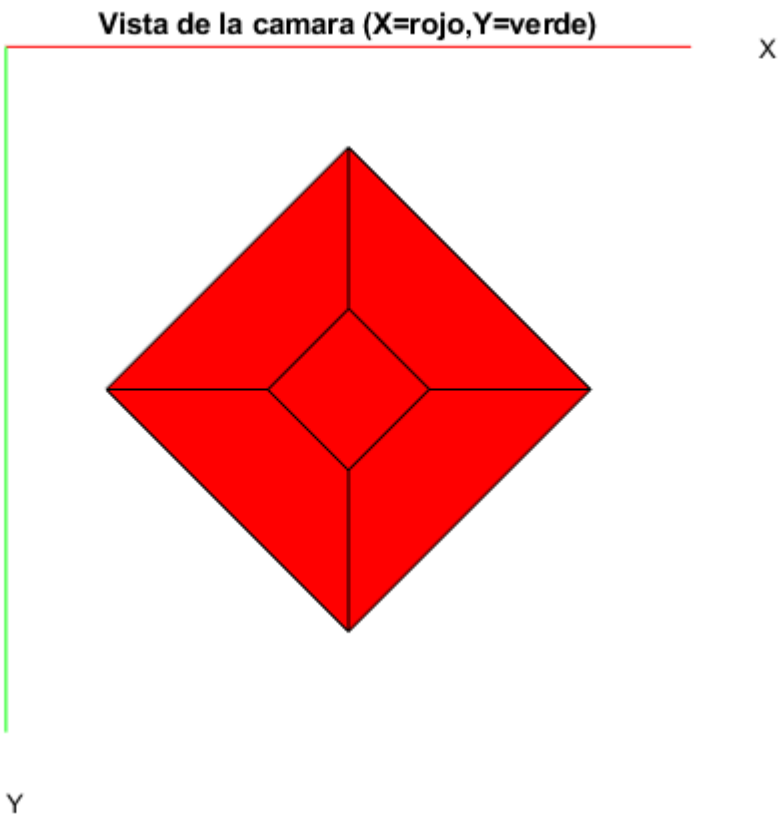
```
theta_x = pi/2; %-3*pi/4;
theta_y = 0;
theta_z = 0; %pi/4;%0;
C = [3 10 3]'; % enfrentado

generar_camara(f, s, px, py, theta_x, theta_y, theta_z, C)
```





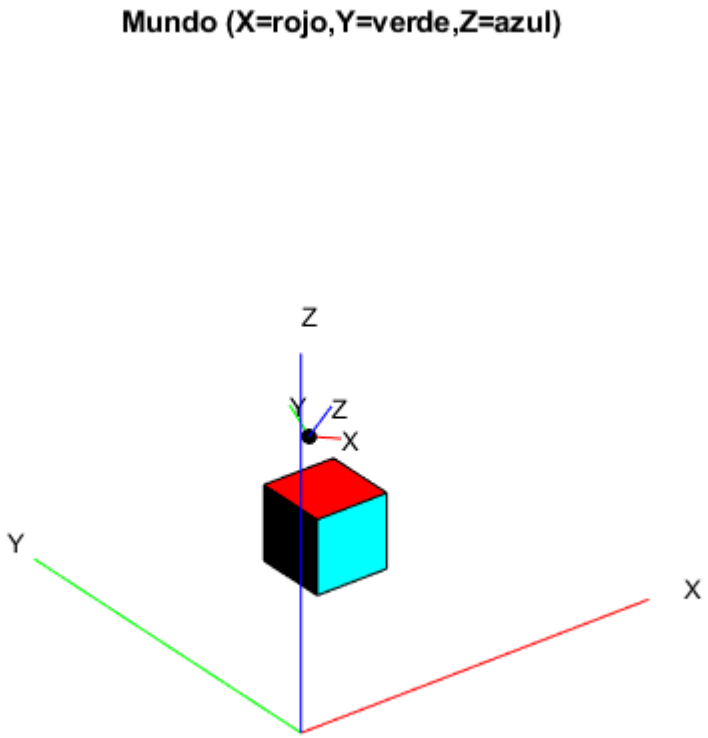

```
f = 0.25;
s = 0;
px = 0.5; py = 0.5;
theta_x = 0;
theta_y = 0;
theta_z = pi/4;
C = [3 3 5]';  % desde arriba, centrado en el cubo

generar_camara(f, s, px, py, theta_x, theta_y, theta_z, C)
```

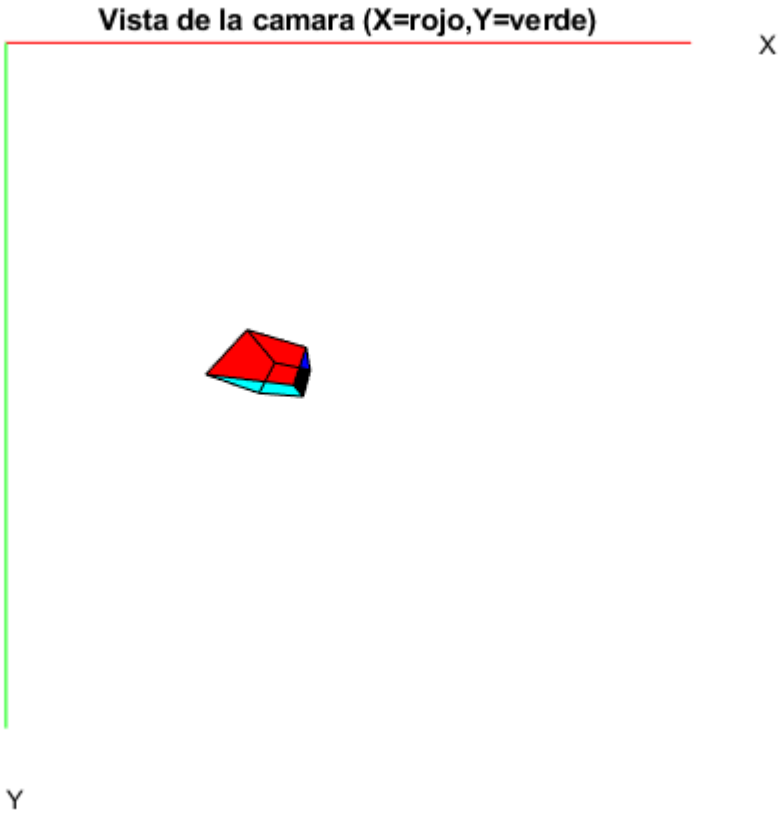




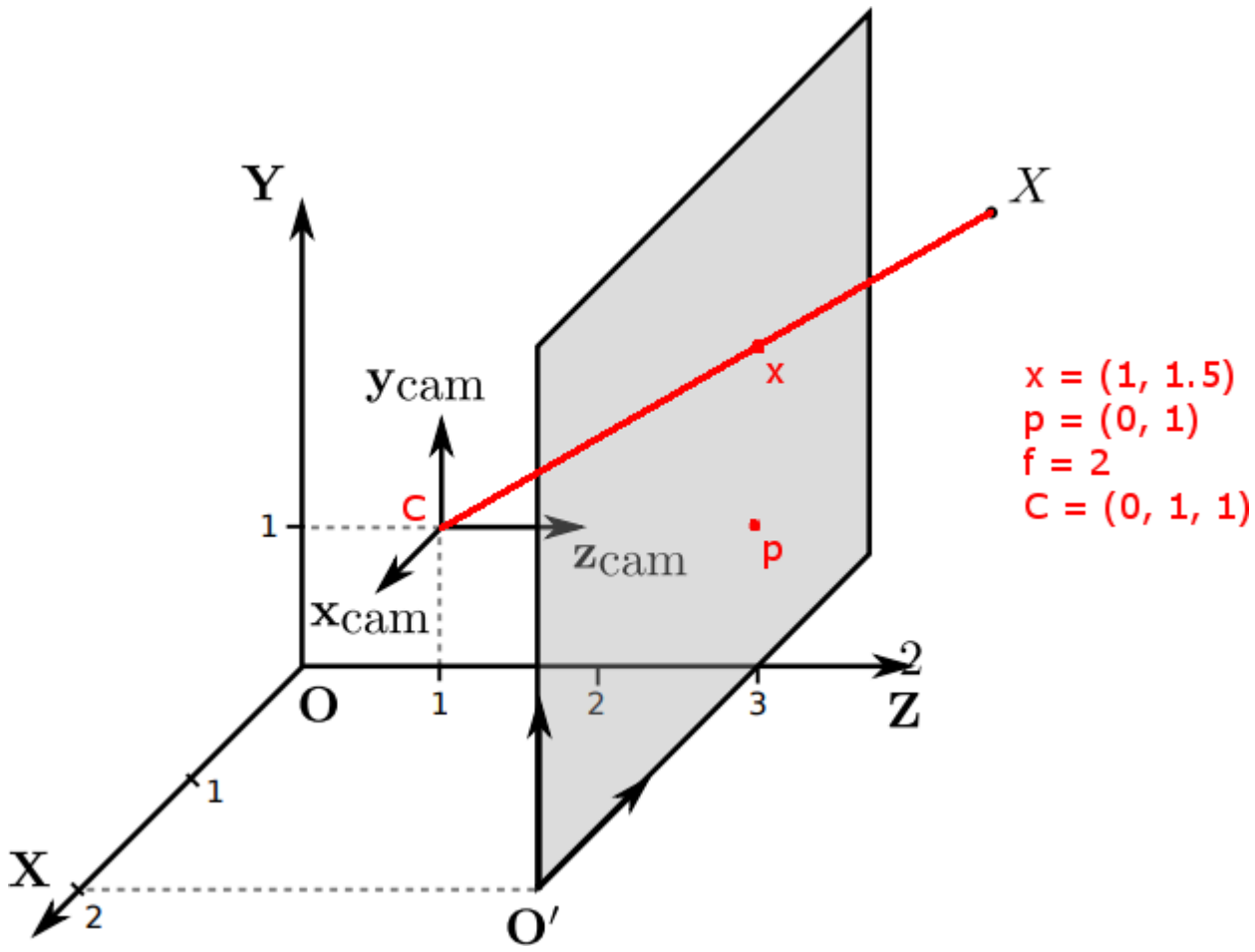

```
f = 0.1;
s = 0;
px = 0.5; py = 0.5;
```

```
theta_x = pi/8;
theta_y = pi/8;
theta_z = 0;
C = [1 1 7]';

generar_camara(f, s, px, py, theta_x, theta_y, theta_z, C)
```





Ejercicio 4




```
X = [2 3 4]';
x_cam = 0;
y_cam = 1;
z_cam = 1;
```

$z_{cam} = 1$ y el plano de la imagen parece estar ubicado en $Z = 3$, entonces:

```
f = 3 - z_cam
```

```
f = 2
```

$x = (\frac{fX}{fZ}, \frac{fY}{fZ})$, luego:

```
x = [f*X(1) / f*X(3); f*X(2) / f*X(3)]
```

```
x = 2×1
    8
   12
```

```
C = [x_cam y_cam z_cam]'
```

```
C = 3×1
    0
```

```
     1
     1
```

Definimos ahora la matriz de calibración K

```
px = 0;
py = 1;
s = 0;  % Suponemos que no hay skewness

K = [f 0 px
     0 f py
     0 0  1]
```

```
K = 3×3
     2     0     0
     0     2     1
     0     0     1
```

```
% Asumimos también que la cámara no está rotada
R = eye(3);
Ri = inv(R);

P = K*Ri*[eye(3) - C]
```

```
P = 3×3
     2     0     0
    -3    -1    -2
    -1    -1     0
```

```
x = P*X
```

```
x = 3×1
     4
   -17
    -5
```

```
xin = [x(1,:)./x(3,:);x(2,:)./x(3,:)]  % x en coordenadas inhomogeneas
```

```
xin = 2×1
   -0.8000
    3.4000
```