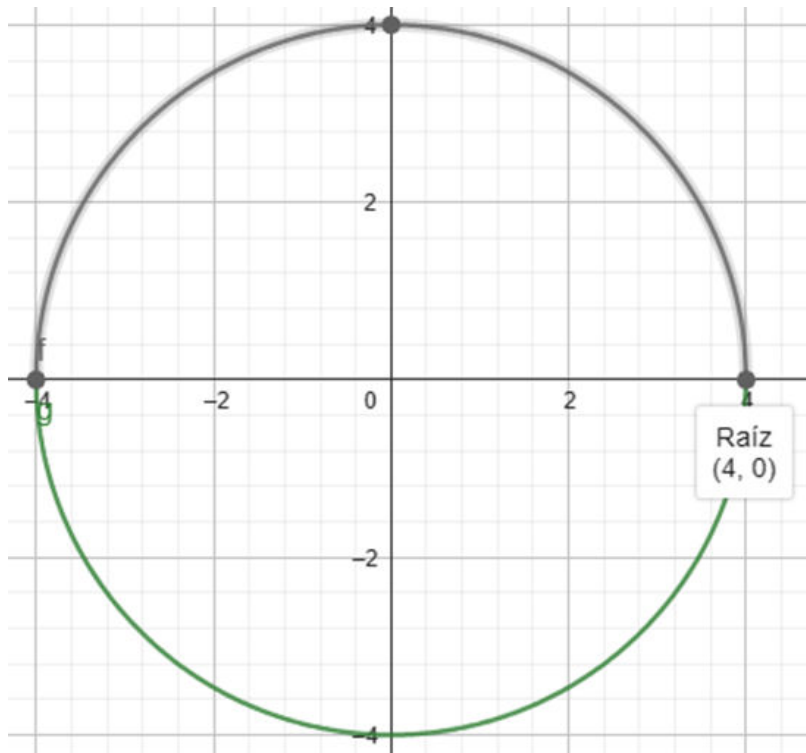


## Actividad 4.1 Circulo.



```
clear
close all
clc

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% TIEMPO %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

Cambiamos el tiempo de simulación a 14 segundos.

```
tf = 14;           % Tiempo de simulacion en segundos (s)
ts = 0.2;          % Tiempo de muestreo en segundos (s)
t = 0: ts: tf;     % Vector de tiempo
N = length(t);     % Muestras

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% CONDICIONES INICIALES %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

x1 = zeros (1,N+1); % Posición en el centro del eje que une las ruedas (eje x) en
metros (m)
y1 = zeros (1,N+1); % Posición en el centro del eje que une las ruedas (eje y) en
metros (m)
phi = zeros(1, N+1); % Orientacion del robot en radianes (rad)
```

Tambien cambiamos la posición inicial de X y Y para el robot, debico a que no inicia en el 0,0

```
x1(1) = 4;        % Posicion inicial eje x
y1(1) = 0;        % Posicion inicial eje y
phi(1) = pi/4;    % Orientacion inicial del robot
```

```

%sigzag
%x1(1) = -5;    % Posicion inicial eje x
%y1(1) = -5;    % Posicion inicial eje y

%circulo
%x1(1) = 4;
%y1(1) = 0;

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% PUNTO DE CONTROL %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

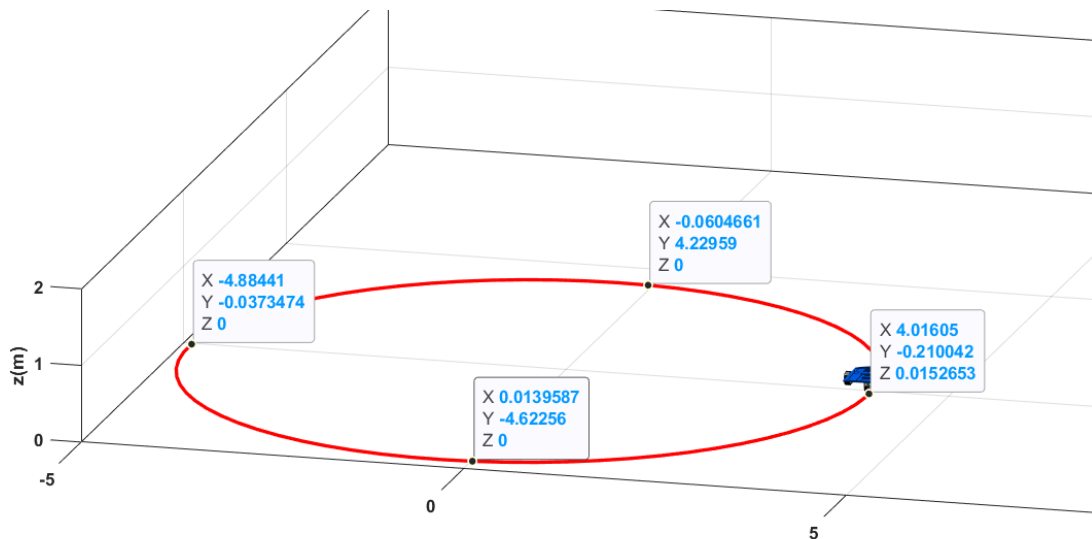
hx = zeros(2, N+1); % Posicion en el punto de control (eje x) en metros (m)
hy = zeros(2, N+1); % Posicion en el punto de control (eje y) en metros (m)

hx(1) = x1(1); % Posicion en el punto de control del robot en el eje x
hy(1) = y1(1); % Posicion en el punto de control del robot en el eje y

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% VELOCIDADES DE REFERENCIA %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
0*ones(1,6)  ,,  pi/2*ones(1,6)

```

Los vectores se fueron modificando con el fin de aplicar la parte de la circunferencia en base a las especificaciones de la imagen. en este caso se prbo con un angulo de  $25^\circ$  ya que con este si llega a cumplir la circunferencia que pasa por los 4 puntos especificados. como se muestra en la siguiente imagen.



tambien esta la parte de poner 1, N, debido a que con el tiempo de 14 terminamos justo en el lugar en el que debe de iniciar.

```

%circulo.
u = [ 2*ones(1,N)]; % Velocidad lineal de referencia (m/s)
w = [ .45*ones(1,N)]; % Velocidad angular de referencia (rad/s)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% BUCLE DE SIMULACION %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

for k=1:N

```

```

phi(k+1)=phi(k)+w(k)*ts; % Integral numérica (método de Euler)

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% MODELO CINEMATICO %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

xp1=u(k)*cos(phi(k+1));
yp1=u(k)*sin(phi(k+1));

x1(k+1)=x1(k) + xp1*ts ; % Integral numérica (método de Euler)
y1(k+1)=y1(k) + yp1*ts ; % Integral numérica (método de Euler)

% Posicion del robot con respecto al punto de control
hx(k+1)=x1(k+1);
hy(k+1)=y1(k+1);

end

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% SIMULACION VIRTUAL 3D %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

% a) Configuracion de escena

scene=figure; % Crear figura (Escena)
set(scene,'Color','white'); % Color del fondo de la escena
set(gca,'FontWeight','bold') ;% Negrilla en los ejes y etiquetas
sizeScreen=get(0,'ScreenSize'); % Retorna el tamaño de la pantalla del computador
set(scene,'position',sizeScreen); % Congigurar tamaño de la figura
camlight('headlight'); % Luz para la escena
axis equal; % Establece la relación de aspecto para que las unidades de datos sean
las mismas en todas las direcciones.
grid on; % Mostrar líneas de cuadrícula en los ejes
box on; % Mostrar contorno de ejes
xlabel('x(m)'); ylabel('y(m)'); zlabel('z(m)'); % Etiqueta de los eje

```

Aqui se cambio la parte de cuando abarcaba el rango de simulación, para que el circulo estuviera dentro de las dimensiones de la simulación.

```

view([15 15]); % Orientacion de la figura
axis([-5 10 -5 10 0 1]); % Ingresar limites minimos y maximos en los ejes x y z
[minX maxX minY maxY minZ maxZ]

% b) Graficar robots en la posicion inicial
scale = 4;
MobileRobot_5;
H1=MobilePlot_4(x1(1),y1(1),phi(1),scale);hold on;

% c) Graficar Trayectorias
H2=plot3(hx(1),hy(1),0,'r','lineWidth',2);

% d) Bucle de simulacion de movimiento del robot

```

```

step=1; % pasos para simulacion

for k=1:step:N

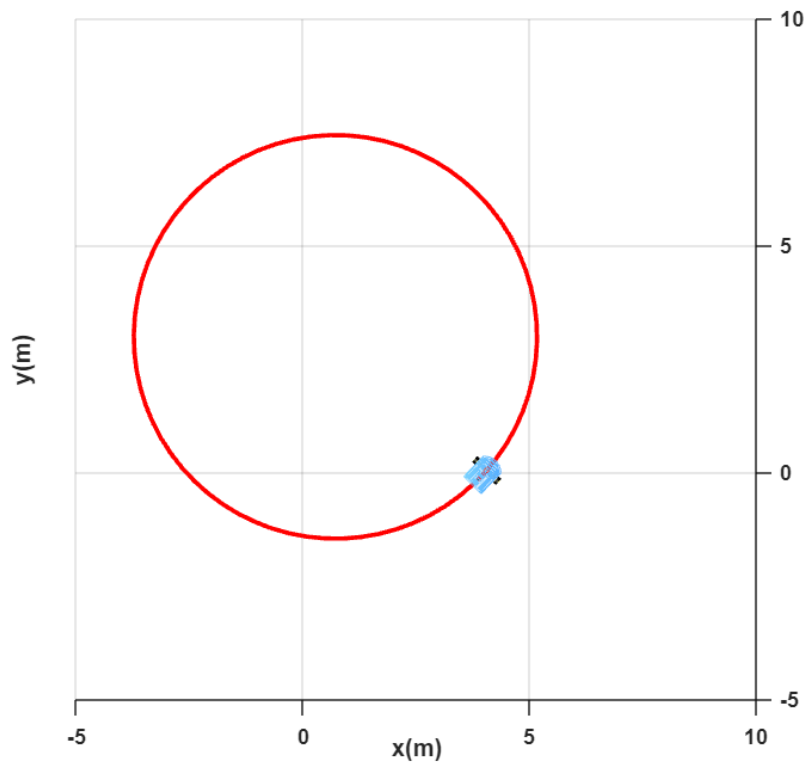
    delete(H1);
    delete(H2);

    H1=MobilePlot_4(x1(k),y1(k),phi(k),scale);
    H2=plot3(hx(1:k),hy(1:k),zeros(1,k),'r','LineWidth',2);

    pause(ts);

end

```



```

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%% Graficas %%%%%%%%%%%%%%%
graph=figure; % Crear figura (Escena)
set(graph,'position',sizeScreen); % Congigurar tamaño de la figura
subplot(211)
plot(t,u,'b','LineWidth',2),grid('on'),xlabel('Tiempo [s]'),ylabel('m/s'),
legend('u');
subplot(212)
plot(t,w,'r','LineWidth',2),grid('on'),xlabel('Tiempo [s]'),ylabel('[rad/s]'),
legend('w');

```

