Señales y Sistemas: Laboratorio Series de Fourier.

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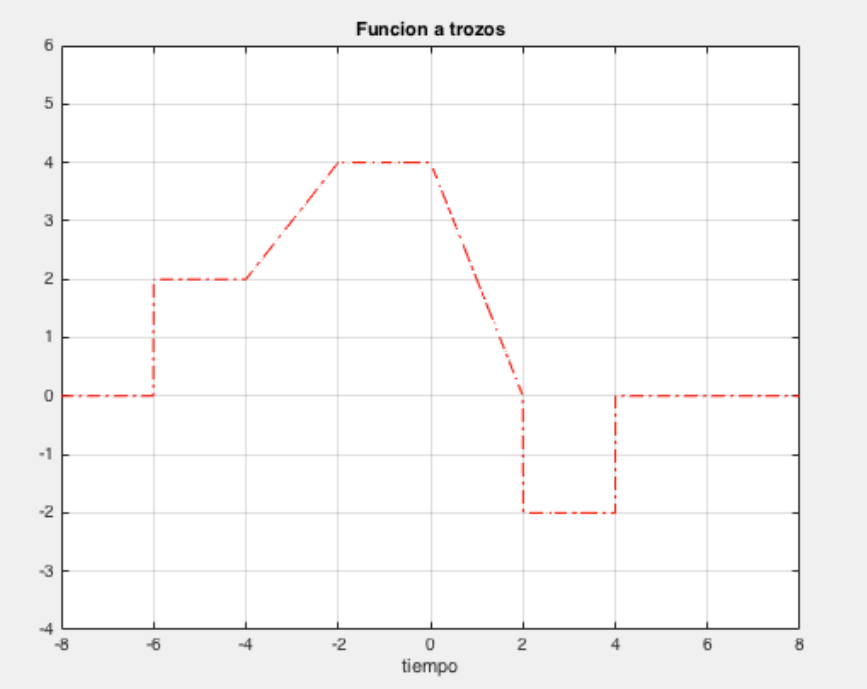
- Graficar la función a trozos correspondiente.

- $$f(x) = \begin{cases} 2; & -6 \leq t < 4 \\ t+6; & -4 \leq t < -2 \\ 4; & -2 \leq t < 0 \\ -2t+4; & 0 \leq t < 2 \\ -2; & 2 \leq t < 4 \\ 2; & 4 \leq t < 6 \\ 0; & otro\ valor \\ & 0 \end{cases}$$

```
% Julián Esteban Nieto Díaz
clc
clear all
% 1) escribir señal x(t), como una funcoin a trozos

t= linspace(-8,8,2000);
f= (2).*((-6<=t)&(t<-4))+(t+6).*((-4<=t) &(t<-2))+(4).*((-2<=t)&(t<0))+(-2*t+4).*((0<=t)&(t<2))+(-2).*((2<=t)&(t<4))+(2).*((4<=t)&(t<2));
figure
plot(t,f,'-.r')
xlabel('tiempo')
grid
hold on
axis([-8 8 -4 6 ])
```

-



2)Coeficientes de fourier

```
% A0
syms t
T=12;
Ao= (1/T)*(int((2),t,-6,-4)+int((t+6),t,-4,-2)+int((4),t,-2,0)+int((-2*t+4),t,0,2)+int((-2),t,2,4)+int((2),t,4,2));
% e= int((-2),t,2,4);f= int((2),t,4,2);
%s=a+b+c+d+e+f; Ao=(1/T)*s;
disp('cte Ao es:');disp(Ao);
```

```
cte Ao es:
7/6
```

Ak

```
syms t k
T=12;
w=(2*pi)/T;
r=w*k*t;
%acos=int((2)*cos(r),t,-6,-4);bcos=int((t+6)*cos(r),t,-4,-2);ccos=int((4)*cos(r),t,-2,0);
%dcos=int((-2*t+4)*cos(r),t,0,2);ecos= int((-2)*cos(r),t,2,4);fcos= int((2)*cos(r),t,4,2);
%scos=acos+bcos+ccos+dcos+ecos+fcos;Ak=(2/T)*scos;
Ak=(2/T)*(int((2)*cos(r),t,-6,-4)+int((t+6)*cos(r),t,-4,-2)+int((4)*cos(r),t,-2,0)+int((-2*t+4)*cos(r),t,0,2)+int((-2)*cos(r),t,2,4)+int((2)*cos(r),t,4,2));
disp('cte Ak es:');disp(Ak);

%bk
%asen=int((2)*sin(r),t,-6,-4);bsen=int((t+6)*sin(r),t,-4,-2);csen=int((4)*sin(r),t,-2,0);
%dsen=int((-2*t+4)*sin(r),t,0,2);esen= int((-2)*sin(r),t,2,4);fsen= int((2)*sin(r),t,4,2);
%ssen=asen+bsen+csen+dsen+esen+fsen;bk=(2/T)*ssen;
bk=(2/T)*(int((2)*sin(r),t,-6,-4)+int((t+6)*sin(r),t,-4,-2)+int((4)*sin(r),t,-2,0)+int((-2*t+4)*sin(r),t,0,2)+ int((-2)*sin(r),t,2,4)+ int((2)*sin(r),t,4,2));
disp('cte bk es:');disp(bk);
```

```
cte Ak es:
(4*sin((pi*k)/3))/(k*pi) + (2*(sin(pi*k) - sin((2*pi*k)/3)))/(k*pi) + (4*(sin((pi*k)/3) - sin((2*pi*k)/3)))/(k*pi) + (12*sin((pi*k)/3)^2)/(k^2*pi^2) + (12*sin((pi*k)/(

cte bk es:
(2*(cos(pi*k) - cos((2*pi*k)/3)))/(k*pi) - (4*(3*sin((pi*k)/3) - pi*k))/(k^2*pi^2) - (36*sin((pi*k)/3) - 72*cos((pi*k)/3)*sin((pi*k)/3) + k*(24*pi*cos((pi*k)/3) - 12*p
```

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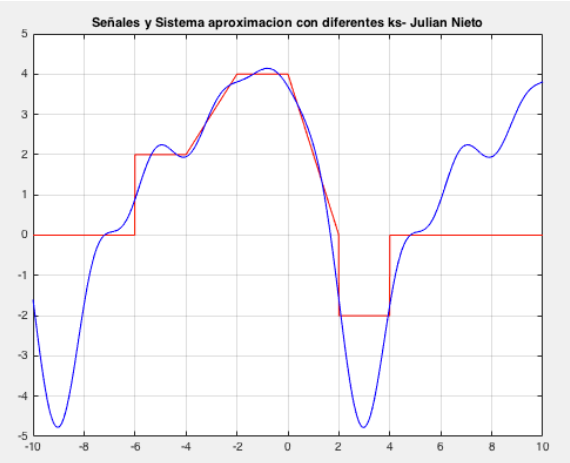
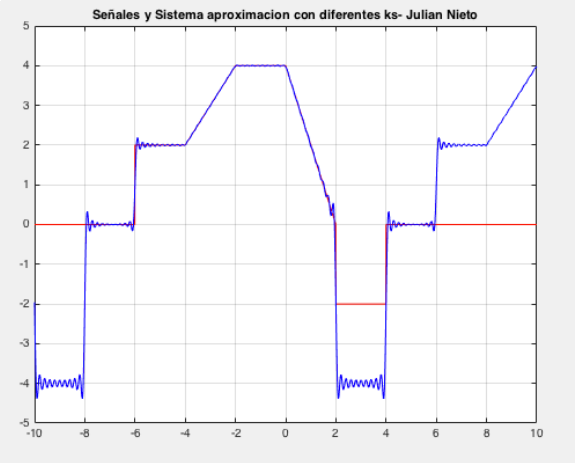
con k=5,60,100






```
clc
clear all
disp('Serie de Fourier- Julian Nieto')
N = input('Numero de armonicos deseados');
x=-10:0.01:10;T=12;sum=0;a0=7/6;w=(2*pi)/T;
for k=1:N
    r=k*w*x;
    a(k)=(4*sin((pi*k)/3))/(k*pi) + (2*(sin(pi*k) - sin((2*pi*k)/3)))/(k*pi) + (4*(sin((pi*k)/3) - sin((2*pi*k)/3)))/(k*pi) + (12*sin((pi*k)/3)^2)
    b(k)= (2*(cos(pi*k) - cos((2*pi*k)/3)))/(k*pi) - (4*(3*sin((pi*k)/3) - pi*k))/(k^2*pi^2) - (36*sin((pi*k)/3) - 72*cos((pi*k)/3)*sin((pi*k)/3)
    sum=sum+(a(k)*cos(r)+b(k)*sin(r));


end

sfour= a0+sum;

f= (2).*((-6<=x)&(x<-4))+(x+6).*((-4<=x) &(x<-2))+(4).*((-2<=x)&(x<0))+(-2*x+4).*((0<=x)&(x<2))+(-2).*((2<=x)&(x<4))+(2).*((4<=x)&(x<2));
plot(x,f,'r',x,sfour,'b')
grid on
title('Señales y Sistema aproximacion con diferentes ks- Julian Nieto')

% a0= 7/6
%ak=(4*sin((pi*k)/3))/(k*pi) + (2*(sin(pi*k) - sin((2*pi*k)/3)))/(k*pi) + (4*(sin((pi*k)/3) - sin((2*pi*k)/3)))/(k*pi) + (12*sin((pi*k)/3)^2)/(k^2
%b(k)=(2*(cos(pi*k) - cos((2*pi*k)/3)))/(k*pi) - (4*(3*sin((pi*k)/3) - pi*k))/(k^2*pi^2) - (36*sin((pi*k)/3) - 72*cos((pi*k)/3)*sin((pi*k)/3) + k*
```

en el command prompt

```
Serie de Fourier- Julian Nieto
Numero de armonicos deseados60
>>
```

```
Serie de Fourier- Julian Nieto
Numero de armonicos deseados100
>>
```