S2 | Señales

Señales básicas

```
%Señal discreta
x = [1 2 3]
```

```
x = 1×3
     1     2     3
```

```
n = [-1 0 1]
```

```
n = 1×3
    -1     0     1
```

```
%Señal continua
syms t
x_1 = t^2
```

```
x_1 = t^2
```

```
```

Ejercicio 1

```
syms t
x = 3*exp(0.4*t)
```

```
x =
```

$$3\,\mathrm{e}^{\frac{2t}{5}}$$

```
y = 2*exp(-0.9*t)
```

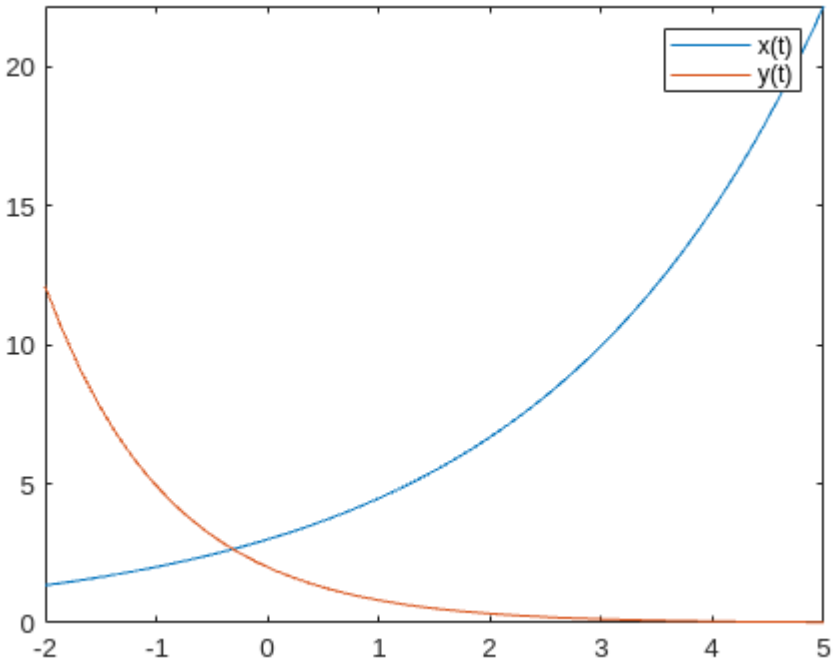
```
y =
```

$$2\,\mathrm{e}^{-\frac{9t}{10}}$$

```
fplot(x,[-2,5])
```

```
Warning: MATLAB has disabled some advanced graphics rendering features by switching to software
OpenGL. For more information, click here.
```

```
hold on
fplot(y,[-2,5])
hold off
legend("x(t)","y(t)")
```

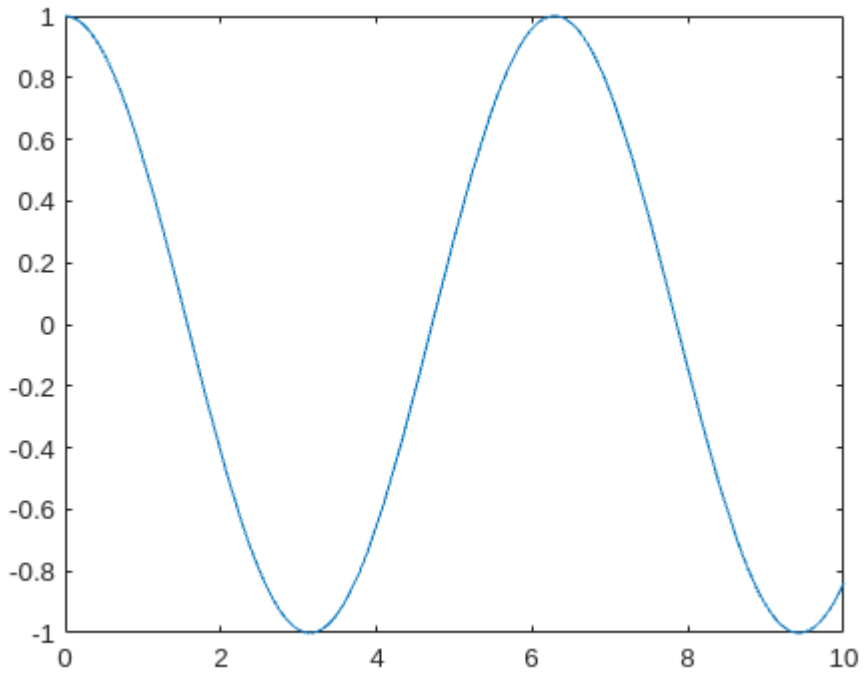


Ejercicio 2

```
syms t
y = cos(t)
```

y = $\cos(t)$

```
fplot(y,[0 10])
```



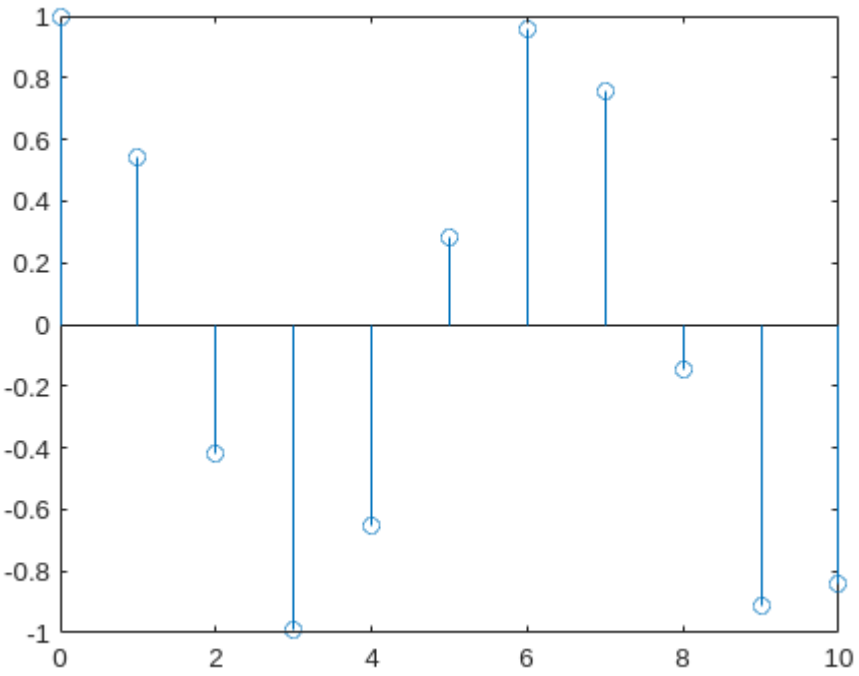

```
n = [0:10]
```

```
n = 1×11
     0     1     2     3     4     5     6     7     8     9    10
```

```
y_1 = cos(n)
```

```
y_1 = 1×11
    1.0000    0.5403   -0.4161   -0.9900   -0.6536    0.2837    0.9602    0.7539 ···
```

```
%plot(n,y_1) Se puede
stem(n,y_1)
```

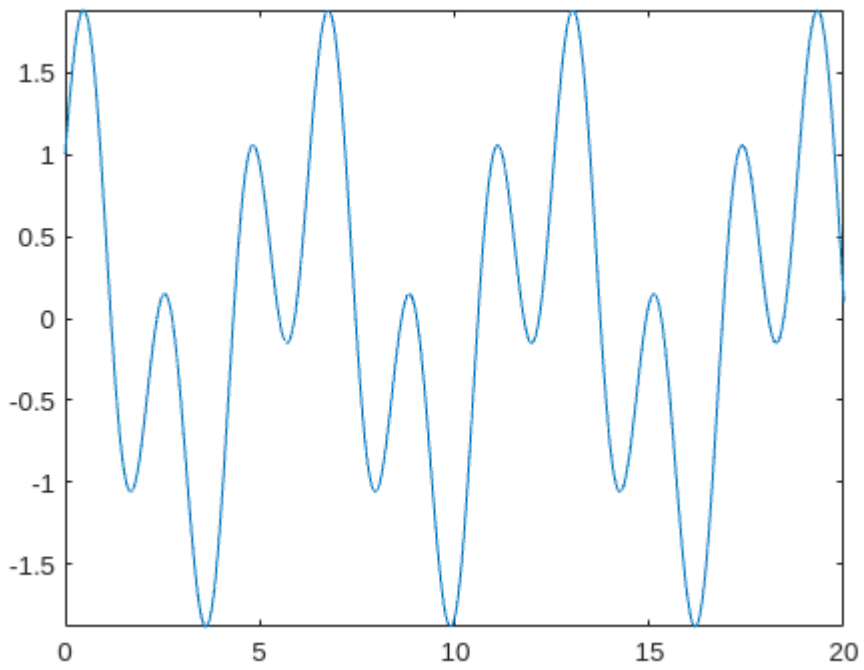


Ejercicio 3

```
syms t
x = cos(t)+sin(3*t)
```

x = $\sin(3\,t)+\cos(t)$

```
fplot(x,[0 20])
```

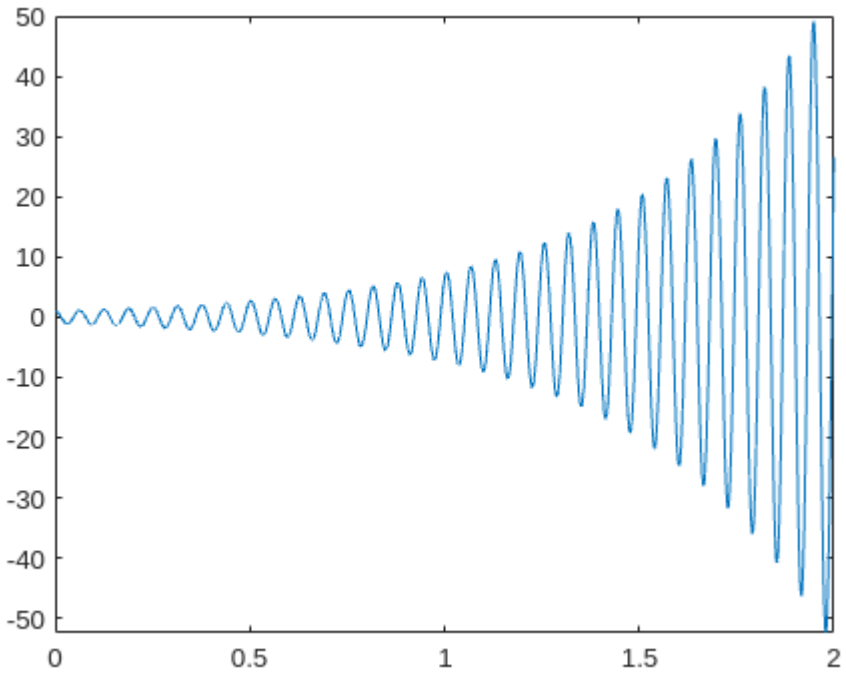


Ejercicio 4

```
syms t
x = cos(100*t)*exp(2*t)
```

x = $\cos(100\,t)\,\mathrm{e}^{2\,t}$

```
fplot(x,[0 2])
```



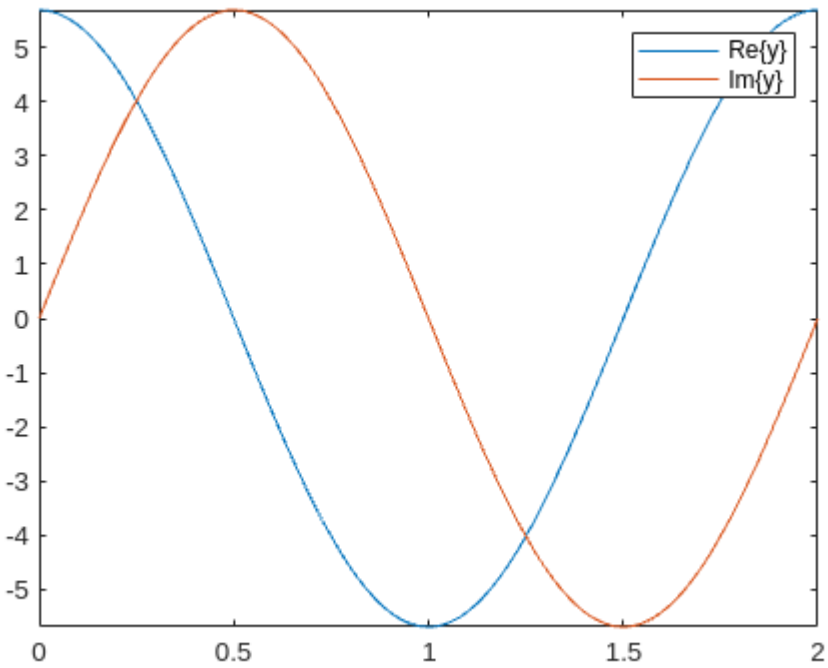
Ejercicio 5

```
syms t
y = 2*exp(1j*pi*t+pi/3)
```

```
y =
```

$$2\,e^{\frac{\pi}{3}+\pi\,t\,i}$$

```
fplot(real(y),[0 2])
hold on
fplot(imag(y),[0 2])
hold off
legend("Re\{y\}","Im\{y\}")
```

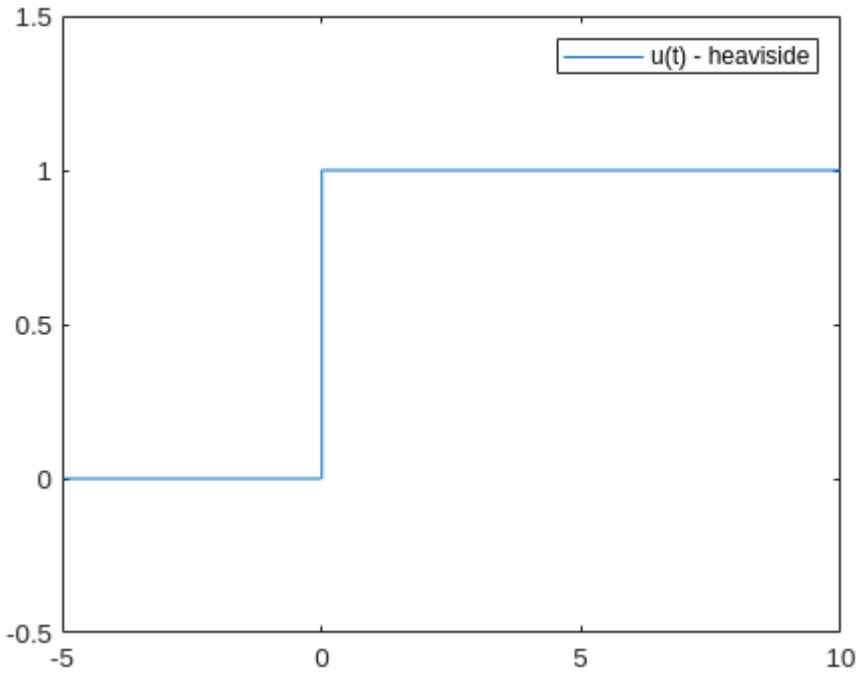


Función Heaviside

```
syms t
u = heaviside(t)
```

u = heaviside(t)

```
fplot(u,[-5 10])
ylim([-0.5 1.5])
legend("u(t) - heaviside")
```




```
heaviside(0)
```

```
ans = 0.5000
```

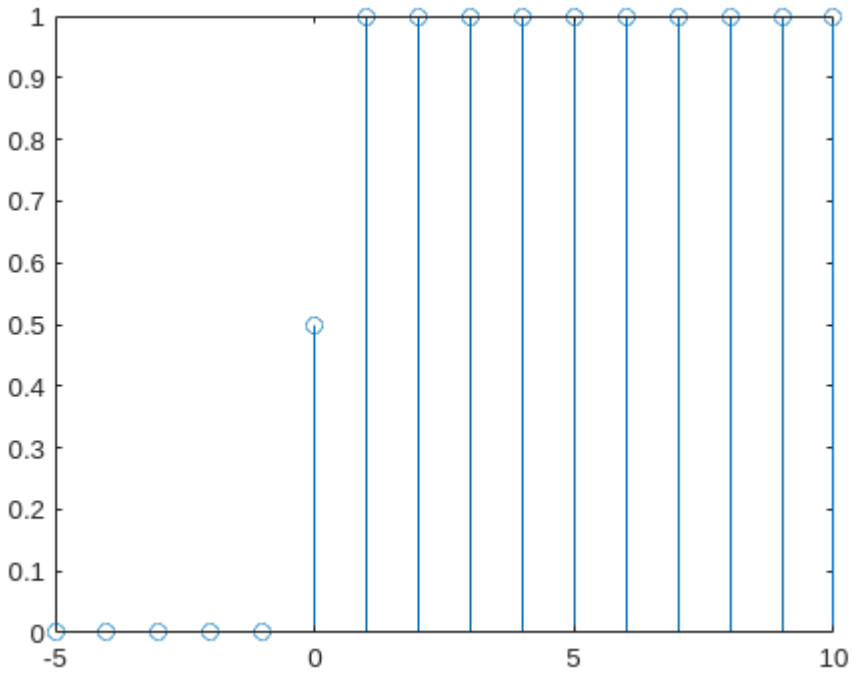
```
n = [-5:10]
```

```
n = 1×16
    -5    -4    -3    -2    -1     0     1     2     3     4     5     6     7 ···
```

```
u_n = heaviside(n)
```

```
u_n = 1×16
         0         0         0         0         0    0.5000    1.0000    1.0000 ···
```

```
stem(n,u_n)
```



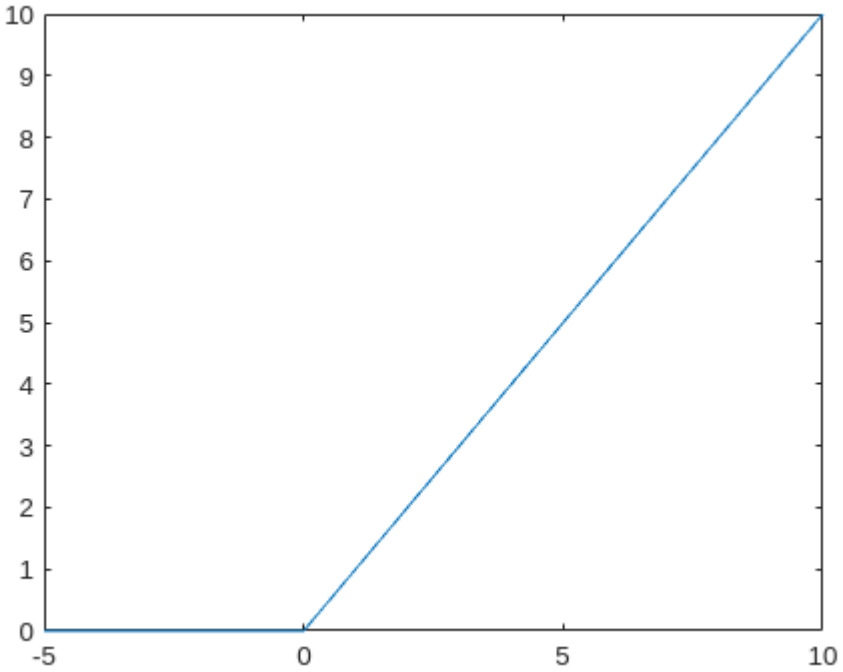
Funcion rampa

```
syms t
r = t*heaviside(t)
```

r = $t\,\mathrm{heaviside}(t)$

```


fplot(r,[-5 10])
```



Pulso rectangular

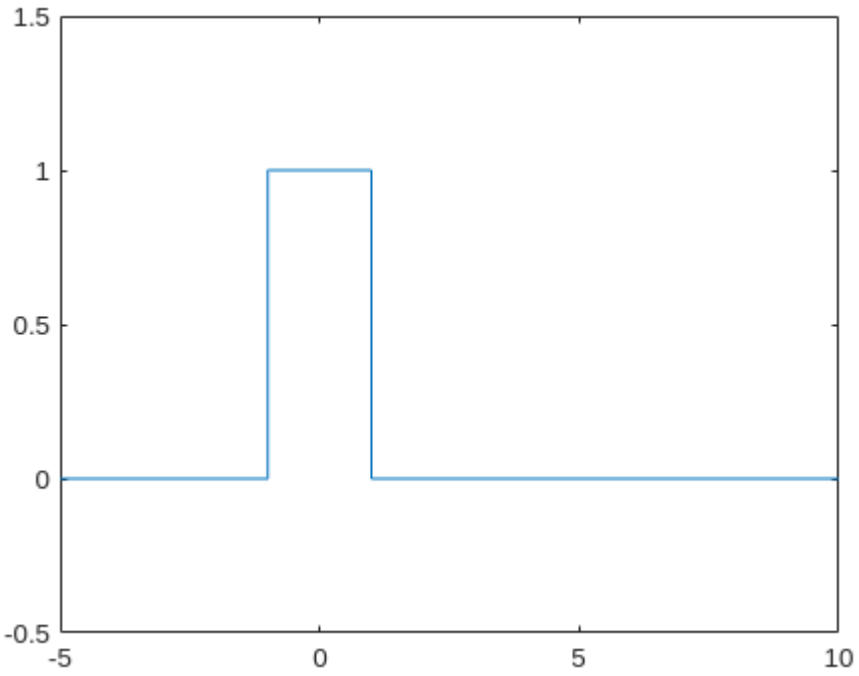
```
syms t
T = 2
```

```
T = 2
```

```
pT = heaviside(t+T/2)-heaviside(t-T/2)
```

$$pT = \text{heaviside}(t+1) - \text{heaviside}(t-1)$$

```
fplot(pT,[-5 10])
ylim([-0.5 1.5])
```



Operaciones

```
syms t
x = t*exp(-t)
```

x = $t\,e^{-t}$

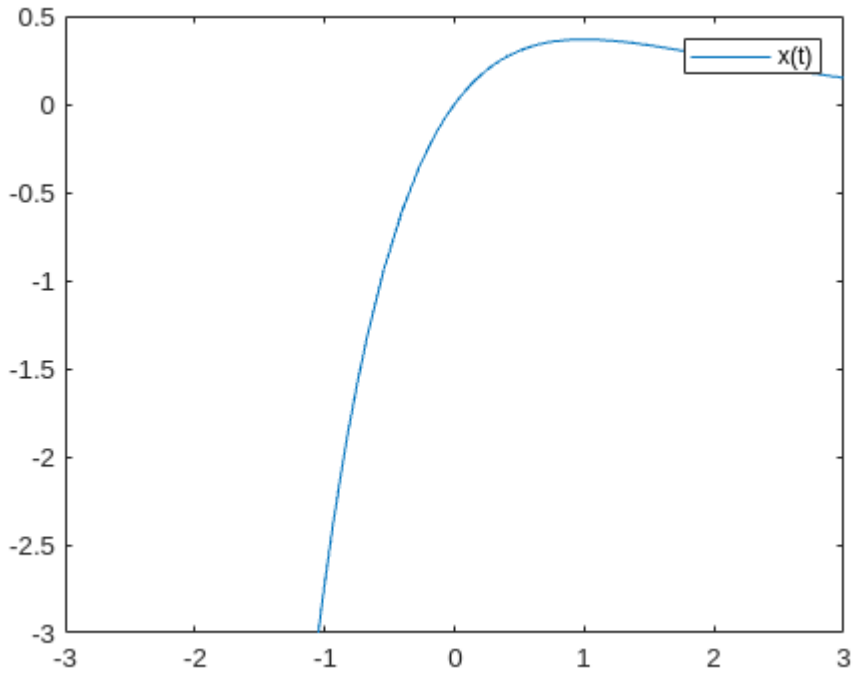
```
%x = heaviside(t)
ylim_interval = [-3 0.5]
```

```
ylim_interval = 1×2
   -3.0000    0.5000
```

```
x_interval = [-3 3]
```

```
x_interval = 1×2
    -3     3
```

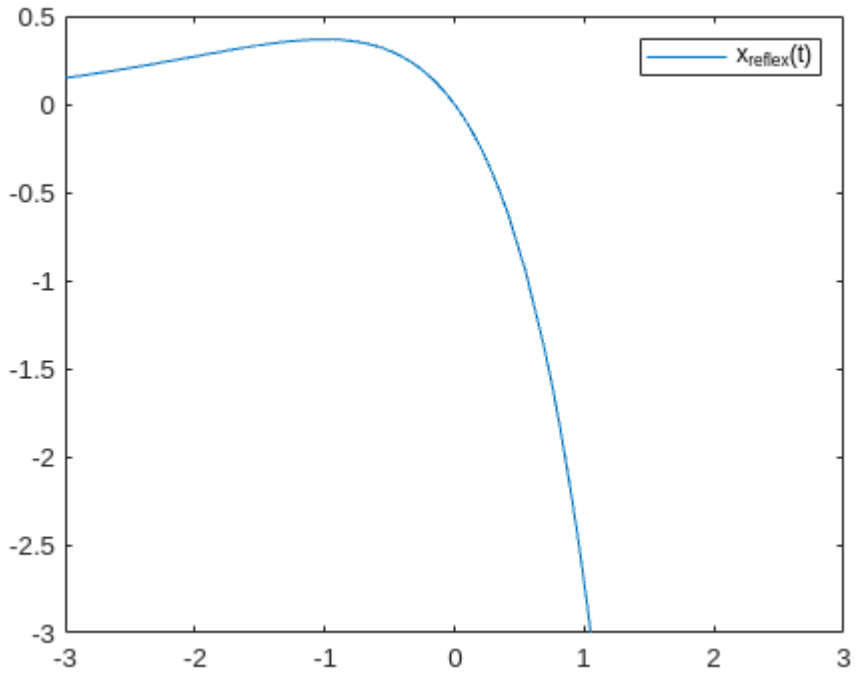
```
%Original
fplot(x, x_interval)
ylim(ylim_interval)
legend("x(t)")
```




```
%Reflejada
x_reflex = subs(x,t,-t)
```

x_reflex = $-t\,e^{t}$

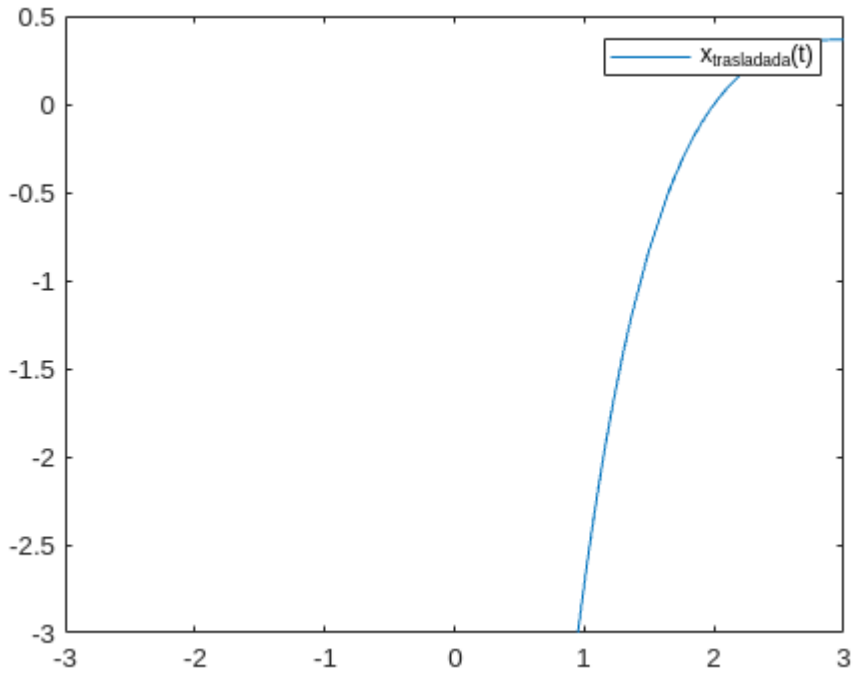
```
fplot(x_reflex,x_interval)
ylim(ylim_interval)
legend("x_{reflex}(t)")
```




```
%Traladada en tiempo
x_tras = subs(x,t,t-2)
```

x_tras = $e^{2-t}\ (t-2)$

```
fplot(x_tras,x_interval)
ylim(ylim_interval)
legend("x_{trasladada}(t)")
```

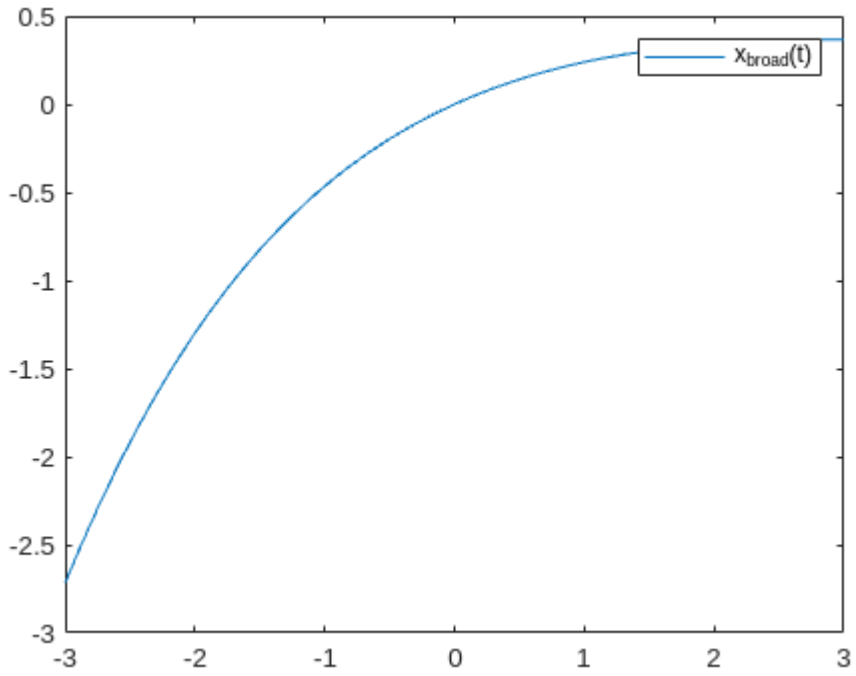



```
%Ensanchada en tiempo
x_broad = subs(x,t,t/3)
```

```
x_broad =
```

$$\frac{t\,e^{-\frac{t}{3}}}{3}$$

```
fplot(x_broad,x_interval)
ylim(ylim_interval)
legend("x_{broad}(t)")
```




```
%Par & impar
x_e = (1/2)*(x+x_reflex)
```

x_e =

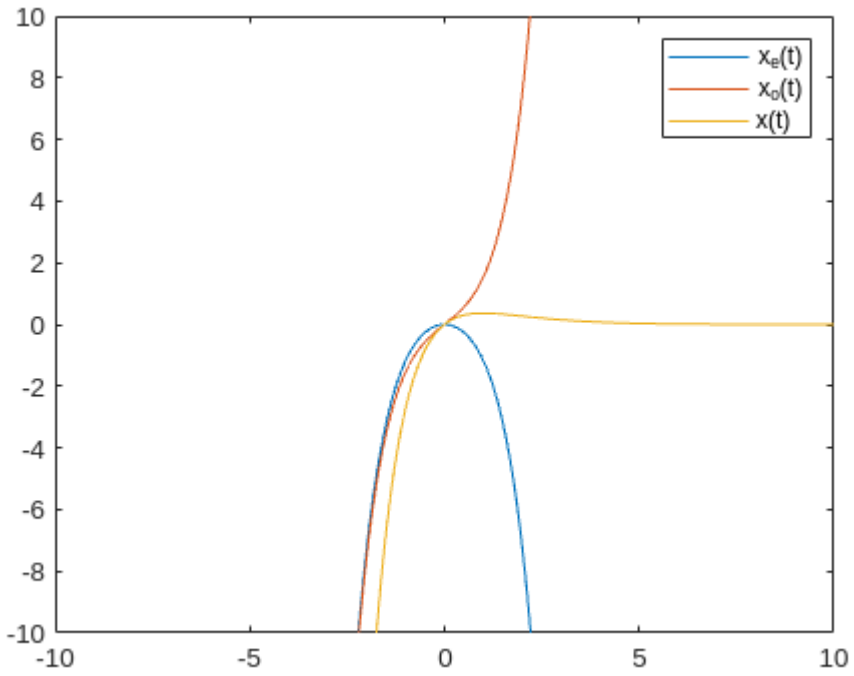
$$\frac{t\,e^{-t}}{2} - \frac{t\,e^{t}}{2}$$

```
x_o = (1/2)*(x-x_reflex)
```

x_o =

$$\frac{t\,e^{-t}}{2} + \frac{t\,e^{t}}{2}$$

```
fplot(x_e,[-10 10])
hold on
fplot(x_o,[-10 10])
fplot(x,[-10 10])
hold off
ylim([-10 10])
legend("x_{e}(t)","x_{o}(t)","x(t)")
```



RMS de funcion seno

```
syms t

T = 2*pi
```

```
T = 6.2832
```

```
%Señal
x = sin(t)
```

x = $\sin(t)$

```
%Energía
E = int(x^2,[0 T])
```

E = π

```
%Potencia
P = E/(T)
```

P =

$\frac{1}{2}$

```
%RMS
RMS = sqrt(P)
```

RMS =

$$\frac{\sqrt{2}}{2}$$

```
var = vpa(RMS)
```

var = 0.70710678118654752440084436210485

```

```