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```
help syms
```

```
  syms   Short-cut for constructing symbolic variables.
     syms arg1 arg2 ...
     is short-hand notation for creating symbolic variables
        arg1 = sym('arg1');
        arg2 = sym('arg2'); ...
     or, if the argument has the form f(x1,x2,...), for
     creating symbolic variables
        x1 = sym('x1');
        x2 = sym('x2');
        ...
        f = symfun(sym('f(x1,x2,...)'), [x1, x2, ...]);
     The outputs are created in the current workspace.

     syms  ... ASSUMPTION
     additionally puts an assumption on the variables created.
```

```
syms t;
func = sin(2*pi*t)
```

func = $\sin(2\pi t)$

```
help subs
```

```
  subs   Symbolic substitution.
     subs(S,OLD,NEW) replaces OLD with NEW in the symbolic expression S.
     OLD is a symbolic variable, a string representing a variable name, or
     an expression. NEW is a symbolic or numeric variable
     or expression.

     subs(S,VALUES), where VALUES is a STRUCT, replaces the symbolic
     variables in S which are field names in VALUES by the corresponding
     entries of the struct.

     subs(S) replaces all the variables in the symbolic expression S with
     values obtained from the calling function, or the MATLAB workspace.

     subs(S,NEW) replaces the free symbolic variable in S with NEW.
```

```
u = -1 : 0.01 : 1
```

```
u = 1×201
   -1.0000   -0.9900   -0.9800   -0.9700   -0.9600   -0.9500   -0.9400   -0.9300   -0.9200   -0.91
```

```
subs(func,t,u)
```

ans =

$$\left(0 \quad \sin\left(\frac{\pi}{50}\right) \quad \sin\left(\frac{\pi}{25}\right) \quad \sigma_{11} \quad \sigma_{20} \quad \sigma_{23} \quad \sigma_{19} \quad \sigma_{10} \quad \sigma_{18} \quad \sigma_{9} \quad \sigma_{1} \quad \sigma_{8} \quad \sigma_{17} \quad \sigma_{7} \quad \sigma_{16} \quad \sigma_{24} \quad \sigma_{15} \quad \sigma_{6} \quad \sigma_{14} \quad \sigma_{5}\right.$$

where

$$\sigma_1 = \frac{\sqrt{2}\ \sqrt{5-\sqrt{5}}}{4}$$

$$\sigma_2 = \frac{\sqrt{2}\ \sqrt{\sqrt{5}+5}}{4}$$

```
help int
```

```
--- help for sym/int ---

 int    Integrate
 int    Integrate
    int(S) is the indefinite integral of S with respect to its symbolic
      variable as defined by SYMVAR. S is a SYM (matrix or scalar).
      If S is a constant, the integral is with respect to 'x'.

    int(S,v) is the indefinite integral of S with respect to v. v is a
      scalar SYM.

    int(S,a,b) is the definite integral of S with respect to its
      symbolic variable from a to b. a and b are each double or
      symbolic scalars. The integration interval can also be specified
      using a row or a column vector with two elements, i.e., valid
```

```
func = sin(2*pi*t)*5
```

func = $5\sin(2\pi t)$

```
int(func,[0,1])
```

ans = 0

```
func = sin(2*pi*t)
```

func = $\sin(2\pi t)$

```
int(func^2,[0,1])
```

ans =

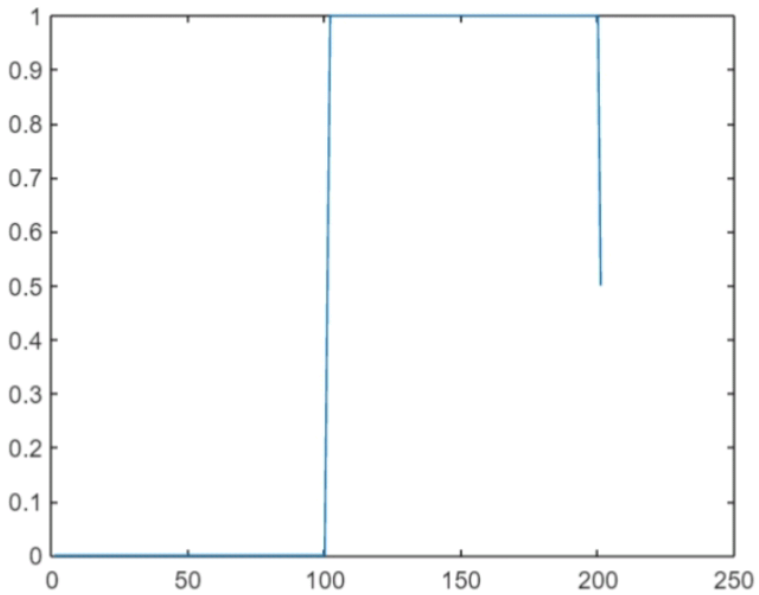
$$\frac{1}{2}$$

```

```

```
%%example-------------------------1

 x=heaviside(t)-heaviside(t-1)
```

```
x = 1×201
     0     0     0     0     0     0     0     0     0     0     0     0     0···
```

```
plot(x);
```

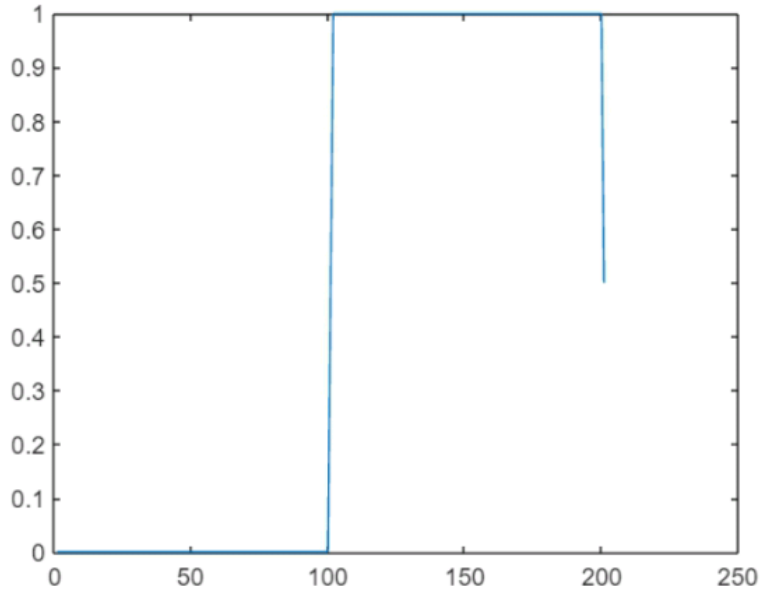



```
h=heaviside(t)-heaviside(t-1)
```

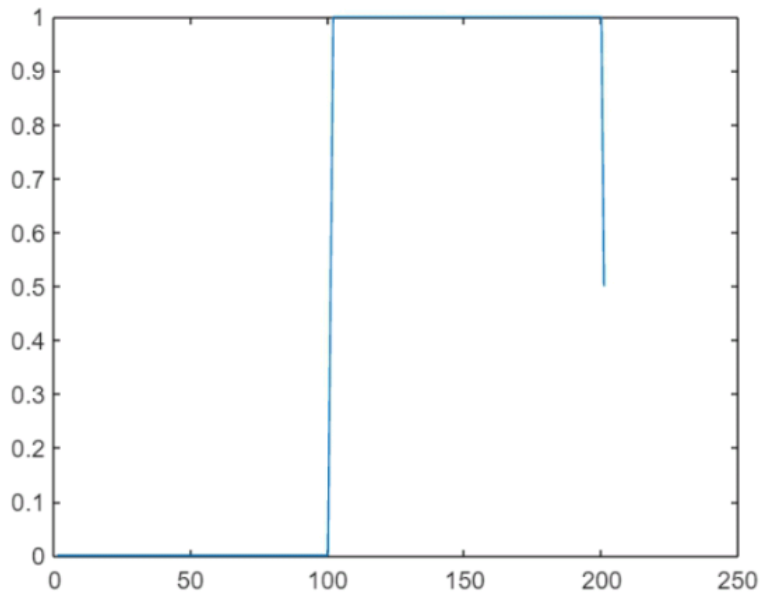
```
h = 1×201
```

```
     0     0     0     0     0     0     0     0     0     0     0     0     0···
```

```
plot (x);
```

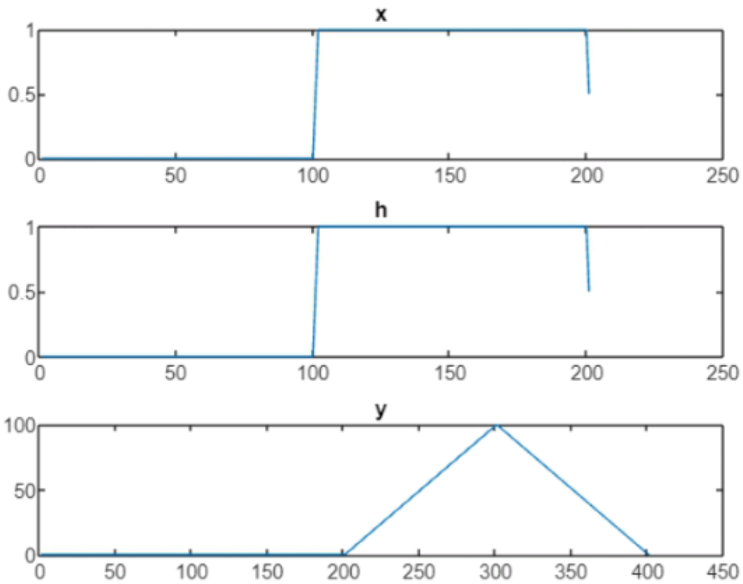



```
plot (h);
```




```
y = conv(x,h);

subplot(3,1,1)
```

```
plot(x)
title('x')
subplot(3,1,2)
plot(h)
title('h')

subplot(3,1,3)
plot(y)
title('y')
```




```
%%EXP-------------------2
x1= heaviside(t)-heaviside(t-1)
```

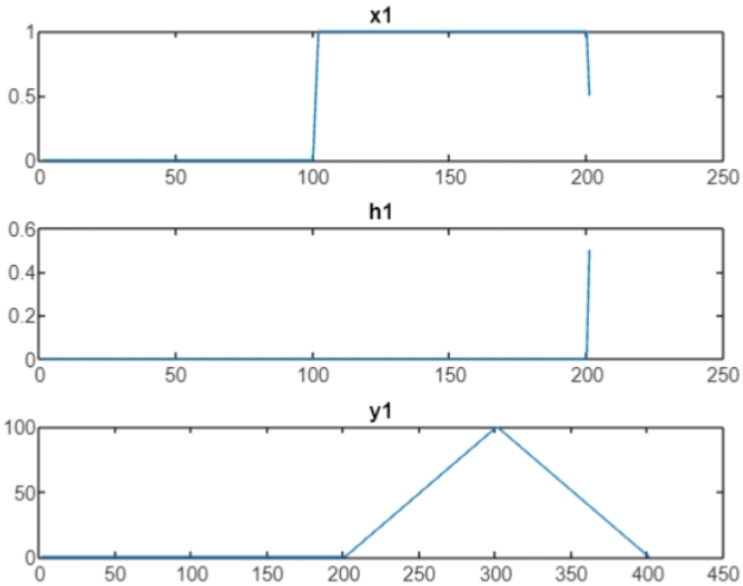
```
x1 = 1×201
     0     0     0     0     0     0     0     0     0     0     0     0     0···
```

```
h1 = heaviside(t-1)- heaviside(t-3)
```

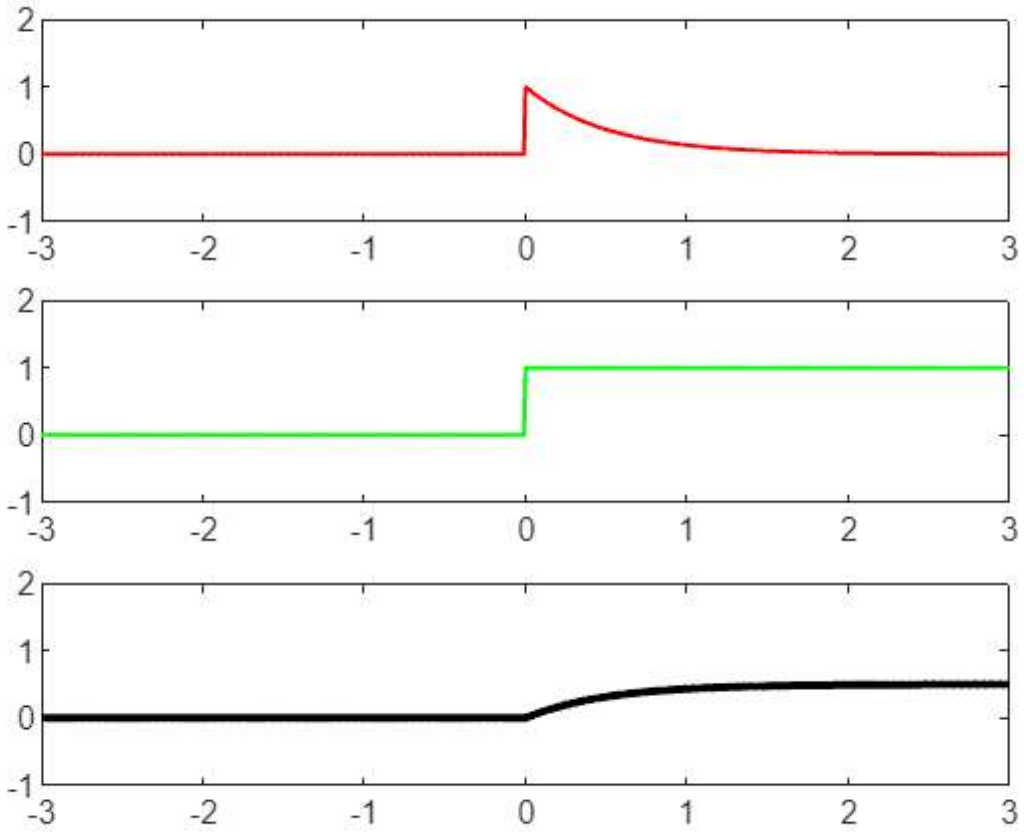
```
h1 = 1×201
     0     0     0     0     0     0     0     0     0     0     0     0     0···
```

```
y1 = conv(x,h);

subplot(3,1,1)
plot(x1)
title('x1')

subplot(3,1,2)
plot(h1)
```

```
title('h1')

subplot(3,1,3)
plot(y1)
title('y1')
```



```
sympref("HeavisideAtOrigin",1);
syms t;
syms T;
t_range=-10:0.01:10;
x2=exp(-2*t).*heaviside(t);
h2=heaviside(t);
h2=subs(h2,t,t-T);
x2=subs(x2,t,T);
f2=x2.*h2;
k2=int(f2,T,[-inf,inf]);
y2=subs(k2,t,t_range);
figure;
subplot(3,1,1)
plot(t_range,subs(x2,T,t_range),"r",LineWidth=1);
axis([-3 3 -1 2]);
subplot(3,1,2)
plot(t_range,subs(h2,t-T,t_range),"g",LineWidth=1);
axis([-3 3 -1 2]);
subplot(3,1,3)
plot(t_range,y2,"k",LineWidth=2);
axis([-3 3 -1 2]);
```




```
syms t;
```

```
syms T;
t_range=-10:0.01:10;
x3=t*(heaviside(t)-heaviside(t-2));
h3=heaviside(t+1)-heaviside(t-1);
h3=subs(h3,t,t-T);
x3=subs(x3,t,T);
f3=x3.*h3;
k3=int(f3,T,[-inf,inf]);
y3=subs(k3,t,t_range);
figure;
subplot(3,1,1)
plot(t_range,subs(x3,T,t_range),"r",LineWidth=1);
axis([-3 3 -1 2]);
subplot(3,1,2)
plot(t_range,subs(h3,t-T,t_range),"g",LineWidth=1);
axis([-3 3 -1 2]);
subplot(3,1,3)
plot(t_range,y3,"k",LineWidth=2);
```