

---

## CUBIC SPLINE INTERPOLATION

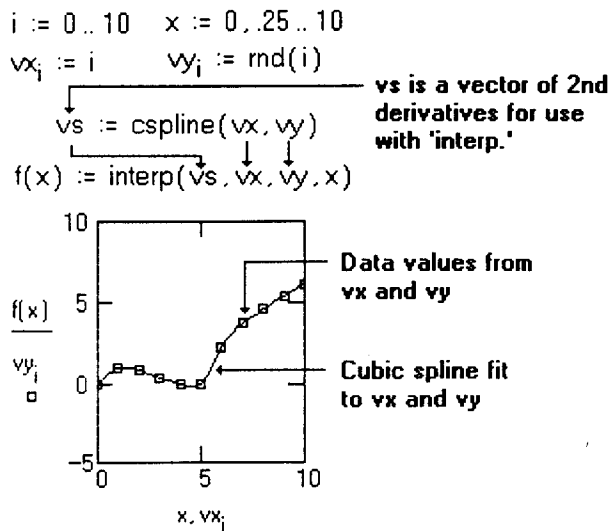
---

- cspline(vx,vy)** Returns vector of second derivatives for data vectors **vx** and **vy**. This vector becomes the first argument of the **interp** function. The resultant spline curve is cubic at the endpoints.
- pspline(vx,vy)** Same as **cspline**, except the resultant spline curve is parabolic at the endpoints.
- lspline(vx,vy)** Same as **cspline**, except the resultant spline curve is linear at the endpoints.
- interp(vs,vx,vy,x)** Returns spline interpolated value of **vy** at a point **x**.

### Arguments:

- ▶ **vx** is a vector of real data values in ascending order. These correspond to the x values.
- ▶ **vy** is a vector of real data values in ascending order. These correspond to the y values. The number of elements is the same as **vx**.
- ▶ **vs** is a vector generated by either **cspline**, **pspline** or **lspline**.
- ▶ **x** is the value of the independent variable at which you want to interpolate a result. For best results, this should be in the range encompassed by the values of **vx**.

The example below illustrates the use of cubic spline interpolation:

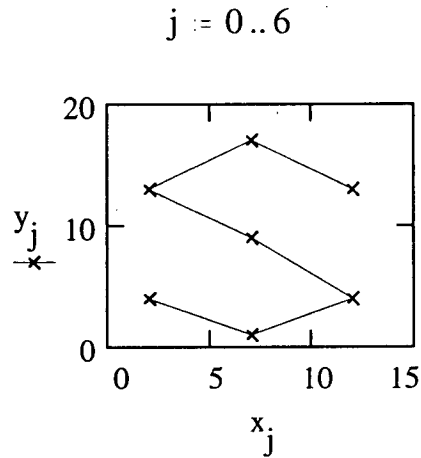


### Related topics:

- [Linear interpolation](#)
- [Linear Prediction](#)

(2) Free form curves in CAD

$$x := \begin{bmatrix} 12 \\ 7 \\ 2 \\ 7 \\ 12 \\ 7 \\ 2 \end{bmatrix} \quad y := \begin{bmatrix} 13 \\ 17 \\ 13 \\ 9 \\ 4 \\ 1 \\ 4 \end{bmatrix}$$



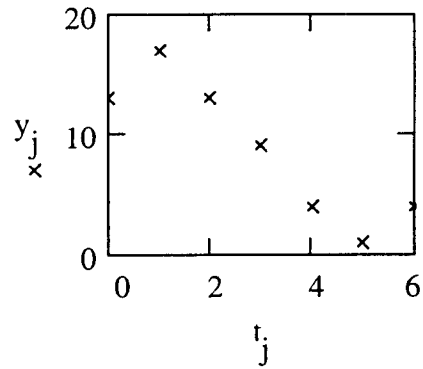
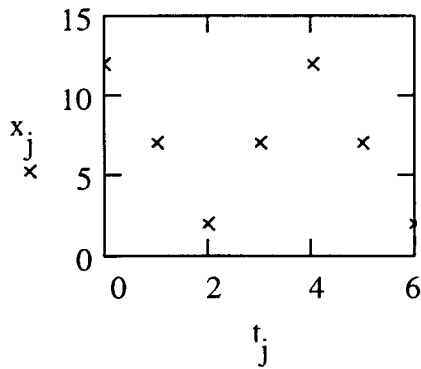
`vs := cspline(x,y)` I cannot interpolate (x,y) with a spline.

domain error

*x must be monotonic.*

Let's introduce a parameter  $t$  and interpolate  $(t,x)$  and  $(t,y)$ .

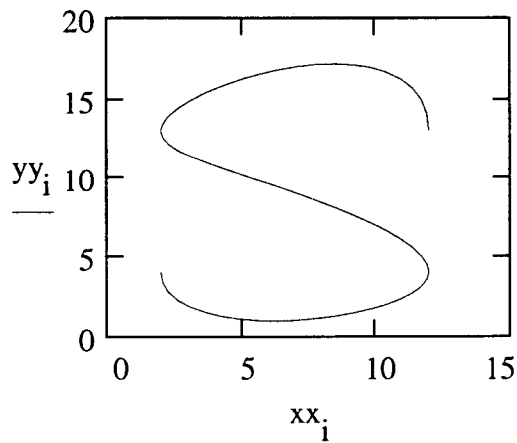
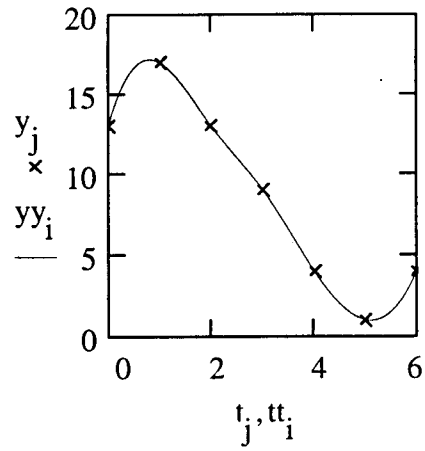
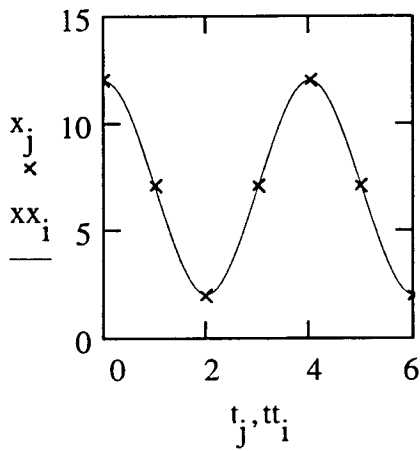
$$t := \begin{bmatrix} 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 6 \end{bmatrix}$$



```
vx := cspline(t,x)    vy := cspline(t,y)
```

```
i := 0..60    tt_i := i*0.1
```

```
xx_i := interp(vx,t,x,tt_i)    yy_i := interp(vy,t,y,tt_i)
```



I could interpolate the point with a cubic spline.