

Description	Syntax	Remarks and examples	Conformability
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## Description

`spline3(x, y)` returns the coefficients of a cubic natural spline  $S(x)$ . The elements of  $x$  must be strictly monotone increasing.

`spline3eval(spline_info, x)` uses the information returned by `spline3()` to evaluate and return the spline at the abscissas  $x$ . Elements of the returned result are set to missing if outside the range of the spline.  $x$  is assumed to be monotonically increasing.

## Syntax

```
real matrix  spline3(real vector x, real vector y)
real vector  spline3eval(real matrix spline_info, real vector x)
```

## Remarks and examples

`spline3()` and `spline3eval()` is a translation into Mata of [Herriot and Reinsch](#) (CUBNATSPLINE) (1973).

For  $xx$  in  $[x_i, x_{i+1})$ :

$$S(xx) = \{(d_i t + c_i)t + b_i\}t + y_i$$

with  $t = xx - x_i$ .

`spline3()` returns  $(b, c, d, x, y)$  or, if  $x$  and  $y$  are row vectors,  $(b, c, d, x', y')$ .

## Conformability

```
spline3(x, y):
  x:      n × 1   or   1 × n
  y:      n × 1   or   1 × n
  result: n × 5

spline3eval(spline_info, x):
  spline_info:  n × 5
  x:           m × 1   or   1 × m
  result:      m × 1   or   1 × m
```

## Diagnostics

`spline3(x, y)` requires that  $x$  be in ascending order.

`spline3eval(spline_info, x)` requires that  $x$  be in ascending order.

## Reference

Herriot, J. G., and C. H. Reinsch. 1973. Algorithm 472: Procedures for natural spline interpolation [E1]. *Communications of the ACM* 16: 763–768. <https://doi.org/10.1145/362552.362558>.

## Also see

[M-4] **Mathematical** — Important mathematical functions

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