

# DIFF

DIFF returns the derivative in a location in a two- or more dimensional space

## Syntax

1. DIFF(Pno%, Ndim%, "ColLab\$\_1,...", "ColLab\$\_Ndim%", Xint\_1, ..., Xint\_Ndim%-1, [DirivNo%])
2. DIFF(0, Npoints%, x\_1, y\_1, x\_2, y\_2,..., x\_n, y\_n, Xint, [DirivNo%=1]) (only in 2D)
3. DIFF(@ObjFn(..), Ndim%, @ObjColPar\_1,..., @ObjColPar\_Ndim%, Xint\_1, ..., Xint\_Ndim%-1, [DirivNo%])
4. DIFF(Telitab\$, Ndim%, "ColLab\$\_1",..., "ColLab\$\_Ndim%", Xint\_1, ..., Xint\_Ndim%-1, [DirivNo%])

### Arguments

- **Pno%** is the number that refers to the [TeLiTab](#) sets in the Data slot. Pno% should be an integer value or a parameter which is assigned an integer value and is the number of the [TeLiTab](#) set in the expressions' data slot.
- **Npoints%** is the number of points (x,y) that are given in direct definition.
- **@ObjFn()** refers to the Object from which data will be used.
- **TeLiTab\$** refers to the string parameter that contains the [TeLiTab](#).
- **Ndim%** is the number of dimensions (or columns in the table...).
- **"ColLab\$\_1"** and **@ObjColPar\_1** refer to the column that will be used as the first parameter in the differentiation.
- **"ColLab\$\_2"** and **@ObjColPar\_2** refer to the column that will be used as the second parameter in the differentiation.
- **Xint** are the coordinates on which to compute the derivative dx/dy.
- **DirivNo%** is an optional argument by which can be indicated for which index of x\_i the differential dx\_i has to be computed. In y=f(x) DirivNo% should either be one (1) or omitted. If omitted or larger than Ndim%-1, the x\_Ndim%-1 is assumed as differential

## Remarks

1. See also Telitab access for a generic description on the use of [TeLiTab](#) data
2. Similar to other Data analysis functions, the DIFF is a convenient way to evaluate data. Please also look at these functions for syntax examples
3. Please realise the dataset provided to DIFF should be a function. Every x-value should have one y-value. Furthermore, in case of a multi-dimensional dataset you should provide a matrix of coordinates.
4. Extrapolation outside the x-range is performed parabolically.

## Examples

### Syntax 1: [TeLiTab](#) in Dataslot

In this example, the [TeLiTab](#) is addressed in the Dataslot. The function y is defined as  $y = \text{DIFF}(1, 2, \text{"XC"}, \text{"YC"}, x, 1)$  With the following Telitab set in the Data slot:

```
|DIFF1|
0
2
"XC" "YC"
"1" 1 1
"2" 2 4
"3" 3 9
"4" 4 16
"5" 5 25
"6" 6 36
"7" 7 49
"8" 8 64
"9" 9 81
"10" 10 100|
```

For  $x = 2.5$ , the function returns

$y=5$  NOTE: In case you apply the symbolic addressing of the columns for the description of the point on the curve or surface to compute the differential for, e.g. "Par\_x" and "Par\_y", please make sure that your Telitab set contains these names. If not, an error message is generated and the calculation is stopped.

### Syntax 2: Direct definition

In direct definition, the points of the curve are stated in the Relation itself. This method can only be used for 2D derivatives, the syntax is: DIFF(Pno%, Ndim%, "ColLab\$\_1,...", "ColLab\$\_Ndim%", Xint, [DirivNo%]) If Pno%=0 then all x\_i and y\_i values should be numeric expressions. The minimum number of x,y data points Ndim% in the list is 2 in which case the interpolation (and differentiation) is performed linear. Let the function y be defined as

$y = \text{DIFF}(0, 4, 1, 1, 2, 4, 3, 9, 4, 16, x, 1)$  For  $x=2.5$ , this function returns

$y=5$

### Syntax 3: TeLiTab in string

We have a relation:

`DataSet2# = TEXTITEM$(1)`

With in its dataslot:

```
TEXTITEM1=|0
3 "X" "Y" "Z"
"1" 1 1 2
"2" 1 4 8
"3" 1 9 18
"4" 1 16 32
"5" 1 25 50
"6" 1 36 72
"7" 1 49 98
"8" 1 64 128
"9" 1 81 162
"10" 1 100 200
"11" 2 1 12
"12" 2 4 18
"13" 2 9 118
"14" 2 16 132
"15" 2 25 150
"16" 2 36 172
"17" 2 49 198
"18" 2 64 1128
"19" 2 81 1162
"20" 2 100 1200
"21" 3 1 22
"22" 3 4 28
"23" 3 9 218
"24" 3 16 232
"25" 3 25 250
"26" 3 36 272
"27" 3 49 298
"28" 3 64 2128
"29" 3 81 2162
"30" 3 100 2200|
```

And use the following relation to determine the derivative:

`Calculated_Value=DIFF(DataSet2#,3,"X","Y","Z", Input_Value_x, Input_Value_y, OptionalDirivNo)`

With `Input_Value_x = 1`, `Input_Value_y = 2` and `OptionalDirivNo = 2` this gives `Calculated_Value=2`

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Quick links: [Functions overview](#) | [Attribute overview](#) | [Constants overview](#) | [Dimensions overview](#)