

Make Polynome option

In Quaestor knowledge engineers are able to generate polynomial information based on matrices of calculations performed in the [Workbase](#). This can be done by means of the *Make Polynome* option in the [Workbase](#). The result will be a recipe you can directly use in the knowledge base (see also the [POL\(\)](#) function).

With this functionality you are able to create simple (polynomial) relations on the basis of series of complex parametric variations you have previously carried out. Please note the functionality has its limits. It will only work within tables with calculated values.

Examples

Create a polynome from a solution

First you should have something Quaestor can make a polynome of. There are limits to this functionality. The main focus when creating this functionality was to be able to create a single polynomial relation based on a table created by parametric varied results.

Assume the following relation:
 $Z = X^2 + Y^2 + C$

We select Z as top goal (after providing a dimension to Z, like [-]) and give values to X, Y and C.
X=1, Y=1, C=1

Now there is a single result for Z (=3). We restart this solution and provide ranges for X, Y and C (in our example 1(1)5 for all parameters). When Quaestor asks whether it should be a case matrix we confirm. The result is a table (matrix) of X, Y, Z and C values (below a cut out of the result as [TeLiTab](#): in the solution do *All to Clipboard* and choose Preview).

```
0
4 "C" "X" "Y" "Z"
"1" 1 1 1 3
"2" 1 1 2 10
... ..
"124" 5 5 4 94
"125" 5 5 5 155
```

When we go to the solution and right click in the gray area, you see that the option *Make Polynome* is available. When you select this option, Quaestor will first ask you the number of terms to use for the polynome. The maximum number of terms indicated by Quaestor is based on the dataset you have selected. More terms means a better fit for values close to the datapoints. Because the polynome will be more "flexible" deviation for values between datapoint may increase (so higher is not always better).

After providing the amount of terms, Quaestor will start regression analysis. This may take a while depending on the size of the dataset and amount of terms specified.

When Quaestor is finished a report is generated (if you do not see it, select *View>Report* in the menu) providing you information on:

1. the recipe for the [POL\(\)](#) function
2. the dataset to combine with the [POL\(\)](#) function
3. the constraints (minimum and maximum values) for the input
4. and information on the fit of the polynome through the original data.

The result for our example:

Solution/Object: Z

Relation:
 $Z = \text{POL}(1, 4, "A", "B", "C", "D", X, Y, C)$

Polynomial coefficients:
[POL1]
0
4 "A" "B" "C" "D"
"1" -8.56273235830528E-14 0 0 0
"2" 1.000000000000002 0 0 1
"3" -3.87168071041632E-16 0 0 3
"4" 4.03169945720986E-15 0 2 0
"5" 1 0 3 0
"6" -9.73589332852376E-18 1 2 3
"7" 1 2 0 0
"8" 7.11044502677828E-19 2 3 3
"9" -4.29795269088716E-18 3 3 0
"10" -4.06607359374704E-19 3 3 2]

Constraints:
X >= 1 AND X <= 5
Y >= 1 AND Y <= 5
C >= 1 AND C <= 5

Regression Analysis Report:

64 terms, Std. error:2.185911E-09 %
63 terms, Std. error:1.292262E-10 %
62 terms, Std. error:5.630967E-11 %
61 terms, Std. error:4.602376E-11 %
60 terms, Std. error:3.280098E-11 %
59 terms, Std. error:2.358838E-11 %
58 terms, Std. error:2.211161E-11 %
57 terms, Std. error:2.092984E-11 %
56 terms, Std. error:1.975320E-11 %
55 terms, Std. error:1.845993E-11 %
54 terms, Std. error:8.409166E-12 %
53 terms, Std. error:7.153771E-12 %
52 terms, Std. error:6.048751E-12 %
51 terms, Std. error:4.830633E-12 %
50 terms, Std. error:4.150604E-12 %
49 terms, Std. error:3.965235E-12 %
48 terms, Std. error:3.268687E-12 %
47 terms, Std. error:2.718620E-12 %
46 terms, Std. error:2.233231E-12 %
45 terms, Std. error:1.972990E-12 %
44 terms, Std. error:1.725768E-12 %
43 terms, Std. error:1.558727E-12 %
42 terms, Std. error:1.481934E-12 %
41 terms, Std. error:1.322706E-12 %
40 terms, Std. error:1.254161E-12 %
39 terms, Std. error:1.227896E-12 %
38 terms, Std. error:1.175588E-12 %
37 terms, Std. error:1.142533E-12 %
36 terms, Std. error:9.863930E-13 %
35 terms, Std. error:8.746619E-13 %
34 terms, Std. error:7.555309E-13 %
33 terms, Std. error:5.754245E-13 %
32 terms, Std. error:3.892598E-13 %
31 terms, Std. error:3.569178E-13 %
30 terms, Std. error:2.613110E-13 %
29 terms, Std. error:2.673237E-13 %
28 terms, Std. error:2.621992E-13 %
27 terms, Std. error:2.417525E-13 %
26 terms, Std. error:1.810973E-13 %
25 terms, Std. error:1.586212E-13 %
24 terms, Std. error:1.392517E-13 %
23 terms, Std. error:1.305220E-13 %
22 terms, Std. error:1.157469E-13 %
21 terms, Std. error:1.148749E-13 %
20 terms, Std. error:1.012362E-13 %
19 terms, Std. error:8.431851E-14 %
18 terms, Std. error:6.524708E-14 %
17 terms, Std. error:5.853444E-14 %
16 terms, Std. error:4.713122E-14 %
15 terms, Std. error:4.449740E-14 %
14 terms, Std. error:3.972974E-14 %
13 terms, Std. error:5.402428E-14 %
12 terms, Std. error:3.790702E-14 %
11 terms, Std. error:2.430670E-14 %
10 terms, Std. error:2.843318E-14 %
Standard error absolute = 2.134535E-14
Standard error percentage = 2.843318E-14 %
Original <-> Computed <-> Percentage
3.000000E+00 <-> 3.000000E+00 <-> 100.00
1.000000E+01 <-> 1.000000E+01 <-> 100.00
2.900000E+01 <-> 2.900000E+01 <-> 100.00
6.600000E+01 <-> 6.600000E+01 <-> 100.00
1.270000E+02 <-> 1.270000E+02 <-> 100.00
6.000000E+00 <-> 6.000000E+00 <-> 100.00
1.300000E+01 <-> 1.300000E+01 <-> 100.00
3.200000E+01 <-> 3.200000E+01 <-> 100.00
6.900000E+01 <-> 6.900000E+01 <-> 100.00
1.300000E+02 <-> 1.300000E+02 <-> 100.00
1.100000E+01 <-> 1.100000E+01 <-> 100.00
1.800000E+01 <-> 1.800000E+01 <-> 100.00
3.700000E+01 <-> 3.700000E+01 <-> 100.00
7.400000E+01 <-> 7.400000E+01 <-> 100.00
1.350000E+02 <-> 1.350000E+02 <-> 100.00
1.800000E+01 <-> 1.800000E+01 <-> 100.00
2.500000E+01 <-> 2.500000E+01 <-> 100.00
4.400000E+01 <-> 4.400000E+01 <-> 100.00
8.100000E+01 <-> 8.100000E+01 <-> 100.00

1.420000E+02 <=> 1.420000E+02 <=> 100.00
2.700000E+01 <=> 2.700000E+01 <=> 100.00
3.400000E+01 <=> 3.400000E+01 <=> 100.00
5.300000E+01 <=> 5.300000E+01 <=> 100.00
9.000000E+01 <=> 9.000000E+01 <=> 100.00
1.510000E+02 <=> 1.510000E+02 <=> 100.00
4.000000E+00 <=> 4.000000E+00 <=> 100.00
1.100000E+01 <=> 1.100000E+01 <=> 100.00
3.000000E+01 <=> 3.000000E+01 <=> 100.00
6.700000E+01 <=> 6.700000E+01 <=> 100.00
1.280000E+02 <=> 1.280000E+02 <=> 100.00
7.000000E+00 <=> 7.000000E+00 <=> 100.00
1.400000E+01 <=> 1.400000E+01 <=> 100.00
3.300000E+01 <=> 3.300000E+01 <=> 100.00
7.000000E+01 <=> 7.000000E+01 <=> 100.00
1.310000E+02 <=> 1.310000E+02 <=> 100.00
1.200000E+01 <=> 1.200000E+01 <=> 100.00
1.900000E+01 <=> 1.900000E+01 <=> 100.00
3.800000E+01 <=> 3.800000E+01 <=> 100.00
7.500000E+01 <=> 7.500000E+01 <=> 100.00
1.360000E+02 <=> 1.360000E+02 <=> 100.00
1.900000E+01 <=> 1.900000E+01 <=> 100.00
2.600000E+01 <=> 2.600000E+01 <=> 100.00
4.500000E+01 <=> 4.500000E+01 <=> 100.00
8.200000E+01 <=> 8.200000E+01 <=> 100.00
1.430000E+02 <=> 1.430000E+02 <=> 100.00
2.800000E+01 <=> 2.800000E+01 <=> 100.00
3.500000E+01 <=> 3.500000E+01 <=> 100.00
5.400000E+01 <=> 5.400000E+01 <=> 100.00
9.100000E+01 <=> 9.100000E+01 <=> 100.00
1.520000E+02 <=> 1.520000E+02 <=> 100.00
5.000000E+00 <=> 5.000000E+00 <=> 100.00
1.200000E+01 <=> 1.200000E+01 <=> 100.00
3.100000E+01 <=> 3.100000E+01 <=> 100.00
6.800000E+01 <=> 6.800000E+01 <=> 100.00
1.290000E+02 <=> 1.290000E+02 <=> 100.00
8.000000E+00 <=> 8.000000E+00 <=> 100.00
1.500000E+01 <=> 1.500000E+01 <=> 100.00
3.400000E+01 <=> 3.400000E+01 <=> 100.00
7.100000E+01 <=> 7.100000E+01 <=> 100.00
1.320000E+02 <=> 1.320000E+02 <=> 100.00
1.300000E+01 <=> 1.300000E+01 <=> 100.00
2.000000E+01 <=> 2.000000E+01 <=> 100.00
3.900000E+01 <=> 3.900000E+01 <=> 100.00
7.600000E+01 <=> 7.600000E+01 <=> 100.00
1.370000E+02 <=> 1.370000E+02 <=> 100.00
2.000000E+01 <=> 2.000000E+01 <=> 100.00
2.700000E+01 <=> 2.700000E+01 <=> 100.00
4.600000E+01 <=> 4.600000E+01 <=> 100.00
8.300000E+01 <=> 8.300000E+01 <=> 100.00
1.440000E+02 <=> 1.440000E+02 <=> 100.00
2.900000E+01 <=> 2.900000E+01 <=> 100.00
3.600000E+01 <=> 3.600000E+01 <=> 100.00
5.500000E+01 <=> 5.500000E+01 <=> 100.00
9.200000E+01 <=> 9.200000E+01 <=> 100.00
1.530000E+02 <=> 1.530000E+02 <=> 100.00
6.000000E+00 <=> 6.000000E+00 <=> 100.00
1.300000E+01 <=> 1.300000E+01 <=> 100.00
3.200000E+01 <=> 3.200000E+01 <=> 100.00
6.900000E+01 <=> 6.900000E+01 <=> 100.00
1.300000E+02 <=> 1.300000E+02 <=> 100.00
9.000000E+00 <=> 9.000000E+00 <=> 100.00
1.600000E+01 <=> 1.600000E+01 <=> 100.00
3.500000E+01 <=> 3.500000E+01 <=> 100.00
7.200000E+01 <=> 7.200000E+01 <=> 100.00
1.330000E+02 <=> 1.330000E+02 <=> 100.00
1.400000E+01 <=> 1.400000E+01 <=> 100.00
2.100000E+01 <=> 2.100000E+01 <=> 100.00
4.000000E+01 <=> 4.000000E+01 <=> 100.00
7.700000E+01 <=> 7.700000E+01 <=> 100.00
1.380000E+02 <=> 1.380000E+02 <=> 100.00
2.100000E+01 <=> 2.100000E+01 <=> 100.00
2.800000E+01 <=> 2.800000E+01 <=> 100.00
4.700000E+01 <=> 4.700000E+01 <=> 100.00
8.400000E+01 <=> 8.400000E+01 <=> 100.00
1.450000E+02 <=> 1.450000E+02 <=> 100.00
3.000000E+01 <=> 3.000000E+01 <=> 100.00
3.700000E+01 <=> 3.700000E+01 <=> 100.00

5.600000E+01 <=> 5.600000E+01 <=> 100.00
9.300000E+01 <=> 9.300000E+01 <=> 100.00
1.540000E+02 <=> 1.540000E+02 <=> 100.00
7.000000E+00 <=> 7.000000E+00 <=> 100.00
1.400000E+01 <=> 1.400000E+01 <=> 100.00
3.300000E+01 <=> 3.300000E+01 <=> 100.00
7.000000E+01 <=> 7.000000E+01 <=> 100.00
1.310000E+02 <=> 1.310000E+02 <=> 100.00
1.000000E+01 <=> 1.000000E+01 <=> 100.00
1.700000E+01 <=> 1.700000E+01 <=> 100.00
3.600000E+01 <=> 3.600000E+01 <=> 100.00
7.300000E+01 <=> 7.300000E+01 <=> 100.00
1.340000E+02 <=> 1.340000E+02 <=> 100.00
1.500000E+01 <=> 1.500000E+01 <=> 100.00
2.200000E+01 <=> 2.200000E+01 <=> 100.00
4.100000E+01 <=> 4.100000E+01 <=> 100.00
7.800000E+01 <=> 7.800000E+01 <=> 100.00
1.390000E+02 <=> 1.390000E+02 <=> 100.00
2.200000E+01 <=> 2.200000E+01 <=> 100.00
2.900000E+01 <=> 2.900000E+01 <=> 100.00
4.800000E+01 <=> 4.800000E+01 <=> 100.00
8.500000E+01 <=> 8.500000E+01 <=> 100.00
1.460000E+02 <=> 1.460000E+02 <=> 100.00
3.100000E+01 <=> 3.100000E+01 <=> 100.00
3.800000E+01 <=> 3.800000E+01 <=> 100.00
5.700000E+01 <=> 5.700000E+01 <=> 100.00
9.400000E+01 <=> 9.400000E+01 <=> 100.00
1.550000E+02 <=> 1.550000E+02 <=> 100.00

You can copy and past the function and data in new relation (copy the data in the dataset of this new relation). And put the constraints as minimum and maximum values in the Slots & Properties window.

Now you can use it als one relation into your knowledge base (Z_polynome in the knowledge base).

Create a polynome from a dataset

In addition to creating a solution, it is also possible to create a polynome on the basis of a dataset. In that case you select de column of the parameter you want to create the polynome for and select *Make Polynome* in the right mouse button menu (select DATA in the example knowledge base).

Example knowledgebase

Download

An example knowledgebase can be downloaded [here](#).

It contains the example as described above.