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# GenIQ: Nonlinear Curve Fitter

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**DM STAT-1** CONSULTING

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GenIQ<sup>®</sup>

# GenIQ: Nonlinear Curve Fitter

- Functions nonlinear in their parameters can not be estimated by OLS regression
- Ex. #1:  $Y = a + b^2 X$ 
  - linear variable, nonlinear in 1 parameter
- Ex. #2:  $Y = X / (aX - b)$ 
  - nonlinear variable & parameters
- Nonlinear models are more difficult to specify and estimate than OLS/linear models. Instead of simply listing regressor variables, you must specify the regression expression/model, and declare parameter names. **GenIQ does the latter.**

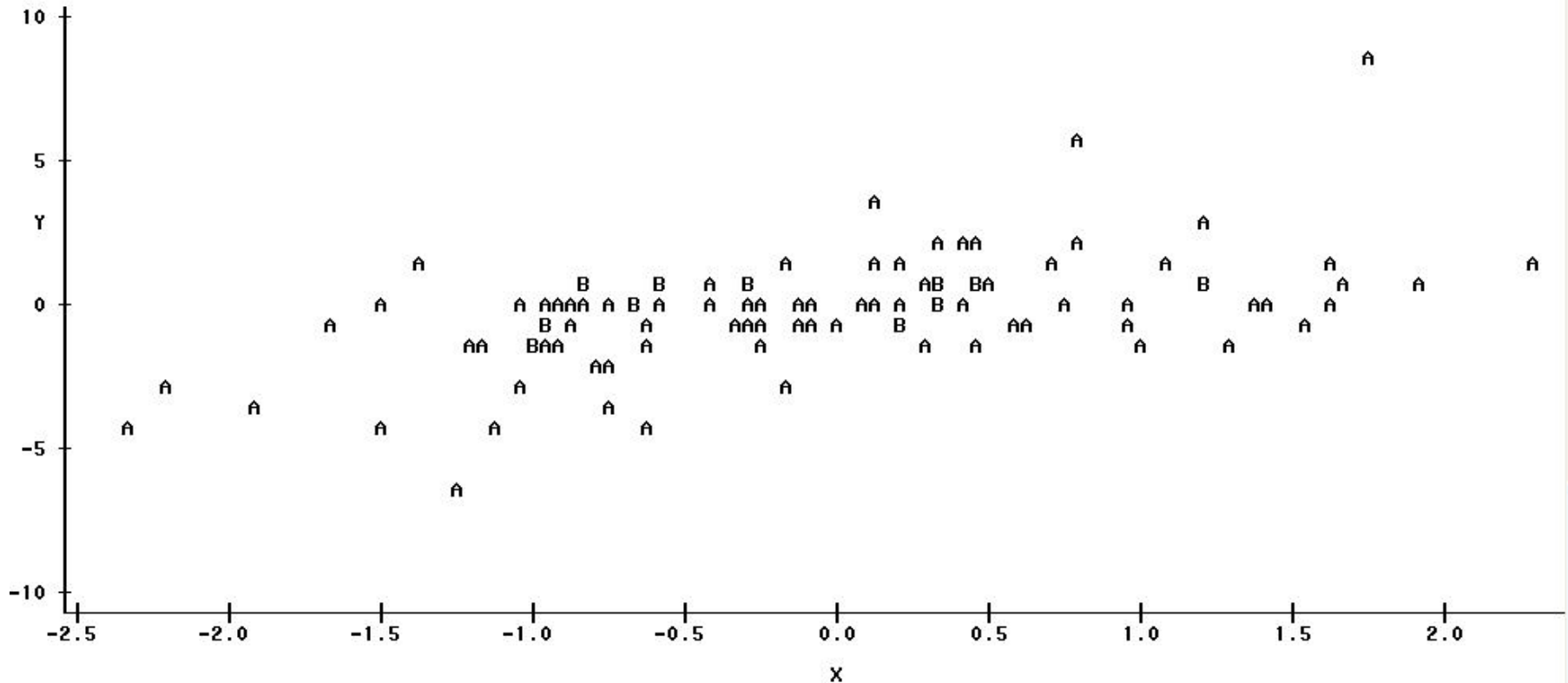
# GenIQ: Nonlinear Curve Fitter

- Using SAS with the program below, I simulate a sample of 100 points (X,Y) from the population of the response surface  $Y = a + b^2X$ 
  - data NLcurve;  
do i= 1 to 100;  
a=normal (i); b=normal (i); X=normal (i);  
output;  
end;  
 $Y = a + (b^{**2}) * X;$   
run;

# GenIQ: Nonlinear Curve Fitter

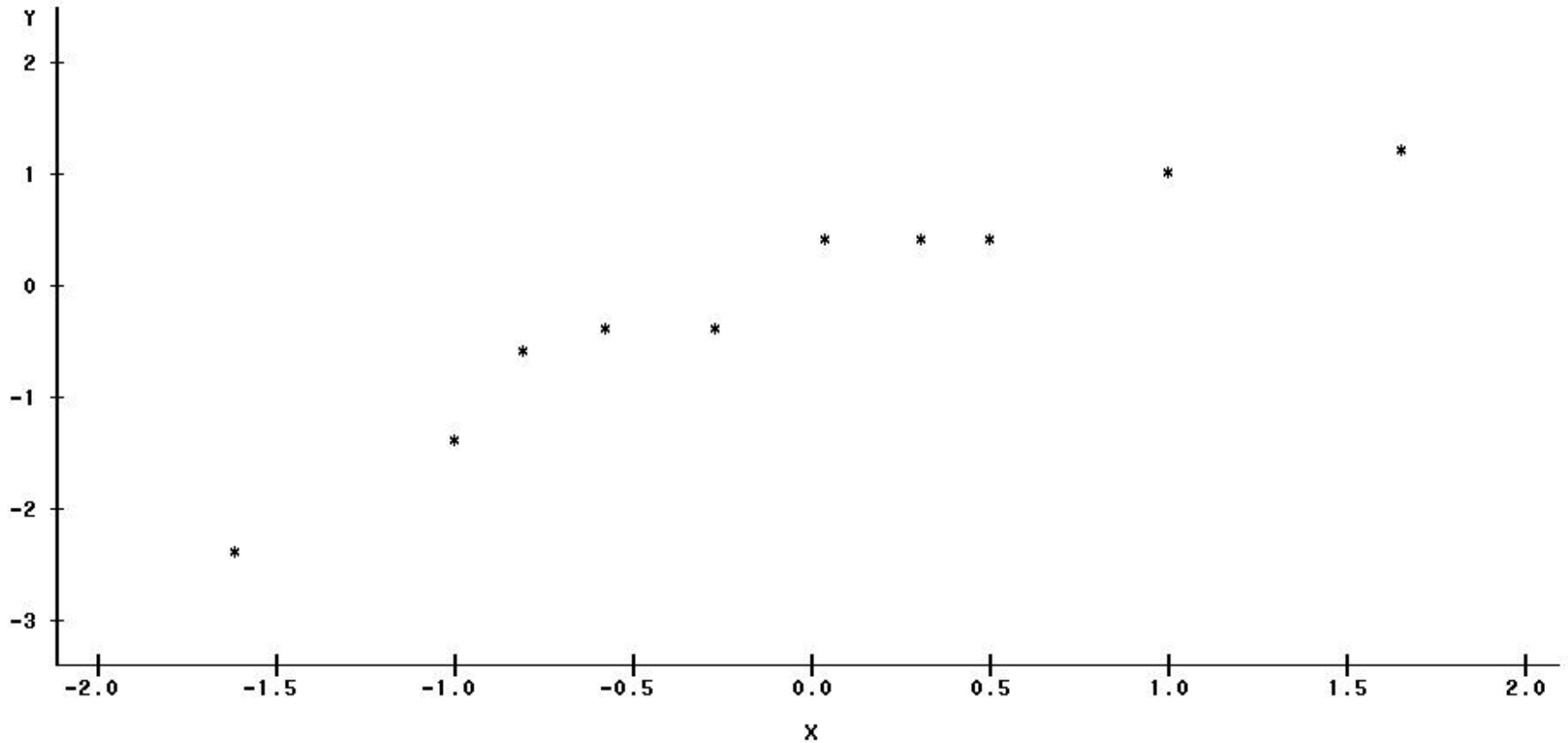
$$Y = a + (b**2)*X$$

Plot of Y\*X. Legend: A = 1 obs, B = 2 obs, etc.



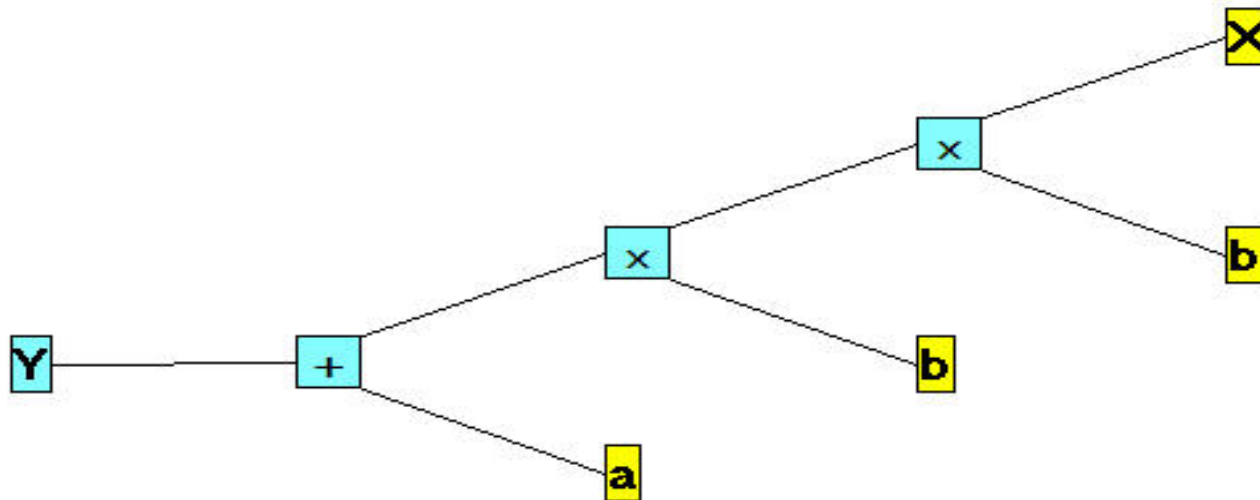
# GenIQ: Nonlinear Curve Fitter

Smooth Plot of (Y,X) from  $Y = a + (b**2)*X$



# GenIQ: Nonlinear Curve Fitter

Ex. #1: GenIQ specifies the regression model, and declares parameter names.



SAS using PROC NLIN estimates:  $Y_{\text{predicted}} = -0.1174 + (-1.0484)^2 X$

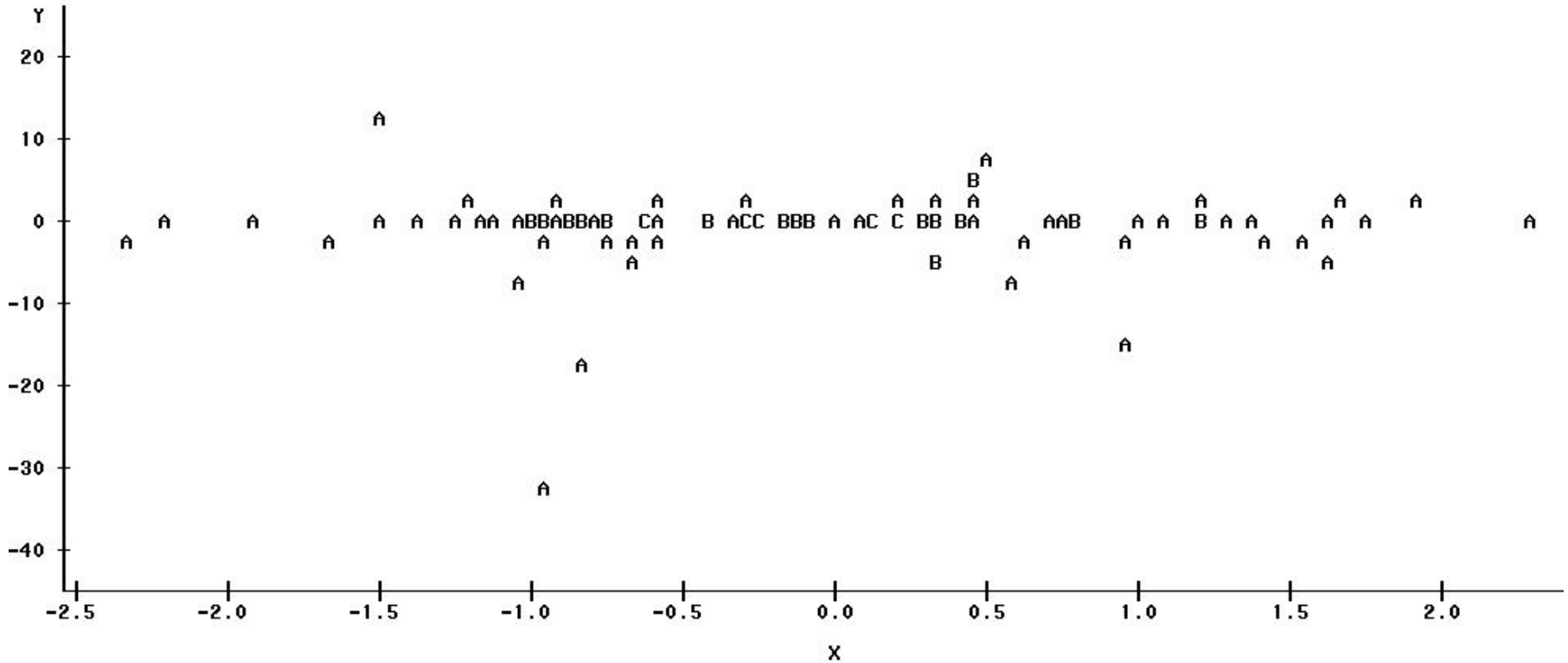
# GenIQ: Nonlinear Curve Fitter

- Ex.#2: Using SAS with the program below, I simulate a sample of 100 points (X,Y) from the population of the response surface  $Y = X / (aX - b)$ 
  - data NLcurve;
  - do i= 1 to 100;
  - a=normal (i); b=normal (i); X=normal (i);
  - output;
  - end;
  - $Y = X / ((a*X) - b);$
  - run;

# GenIQ: Nonlinear Curve Fitter

$$Y = (X) / (aX - b)$$

Plot of Y\*X. Legend: A = 1 obs, B = 2 obs, etc.

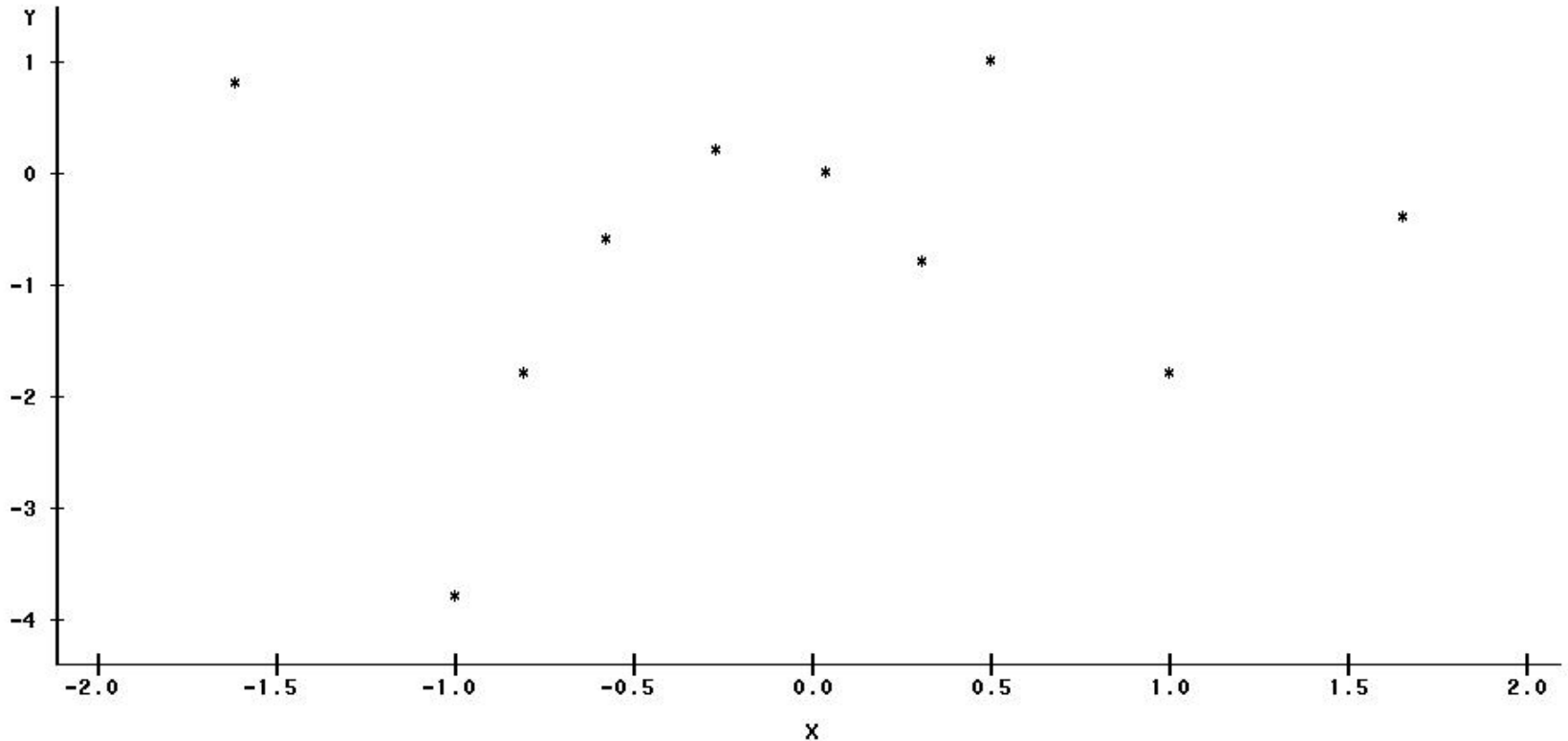




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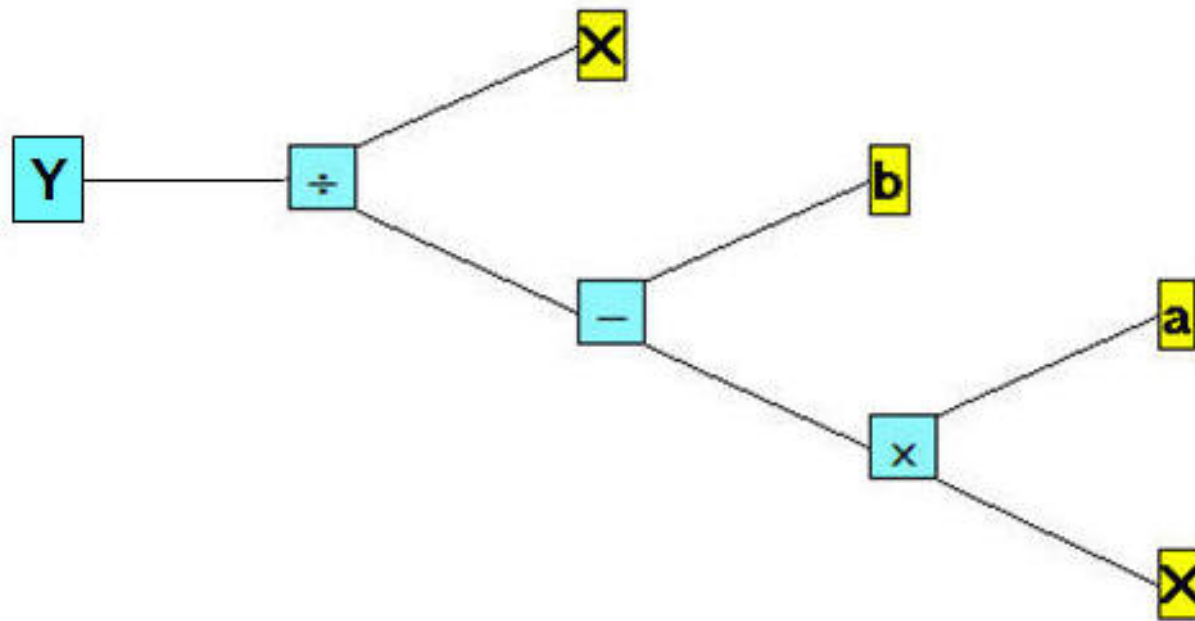
Smooth Plot of (Y,X) from  $Y = X / (aX - b)$

Plot of Y\*X. Symbol used is '\*'.



# GenIQ: Nonlinear Curve Fitter

Ex.#2: GenIQ specifies the regression model, and declares parameter names.



SAS using PROC NLIN estimates:  $Y_{\text{predicted}} = X / ((23.3983 * X) - 43.8189)$