

# ***FitAll's* Built-in Functions**

The following contains a description of the functions that are available in *FitAll's* standard Function Libraries.

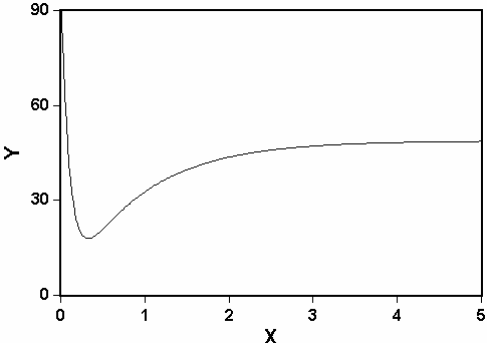
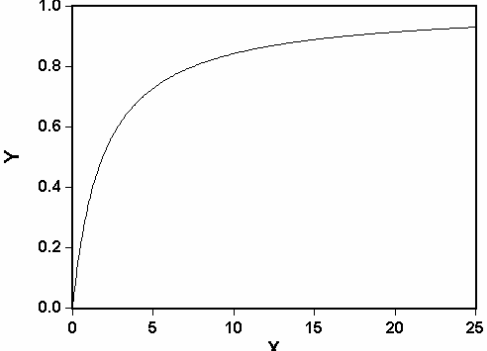
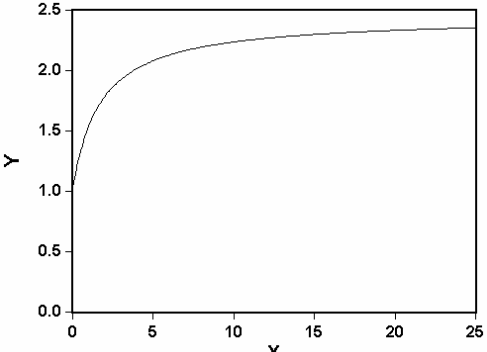
The example graph is presented as an illustration of what a graph of the function may look like. With different parameter values the function's graph could look substantially different from the one illustrated in this document.

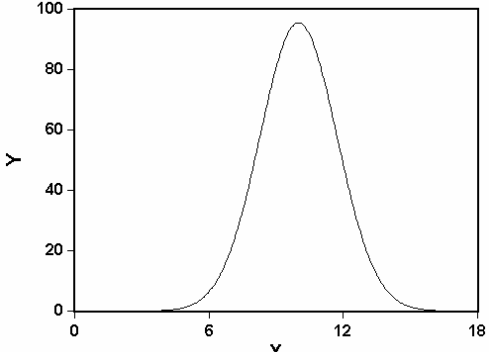
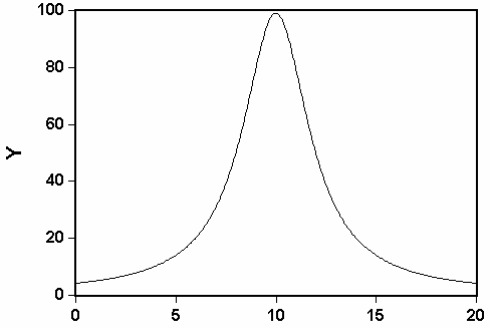
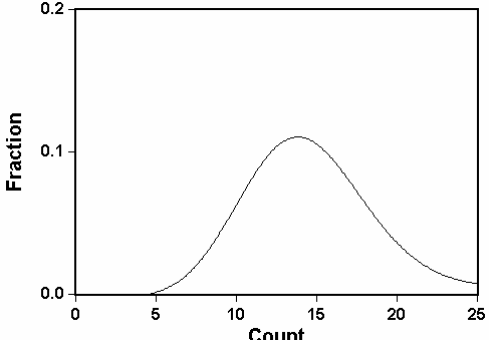
In the function definitions:

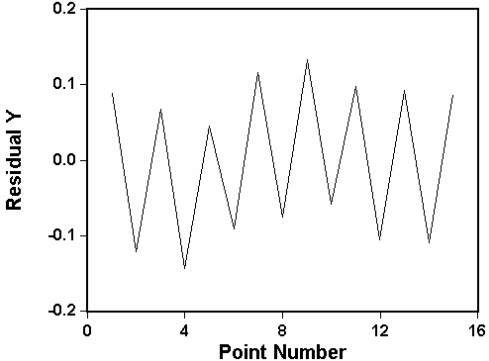
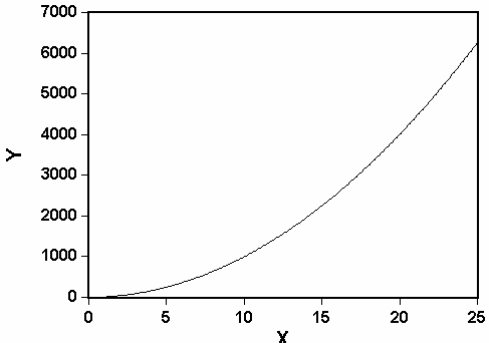
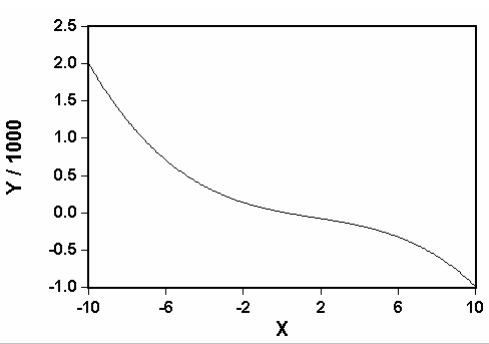
1. Y is the dependent variable.
2. The X's are the independent variables.
3. The K's are constants, the values of which can be changed at runtime.
4. The P's are the parameters that are resolved / determined.

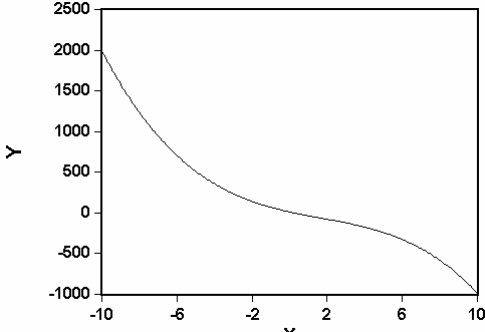
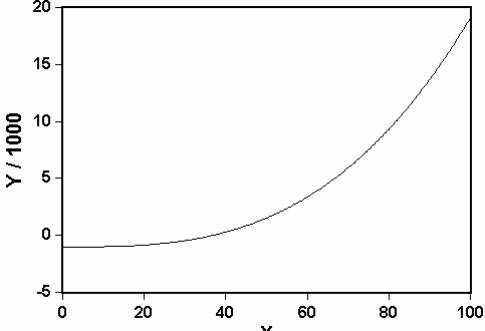
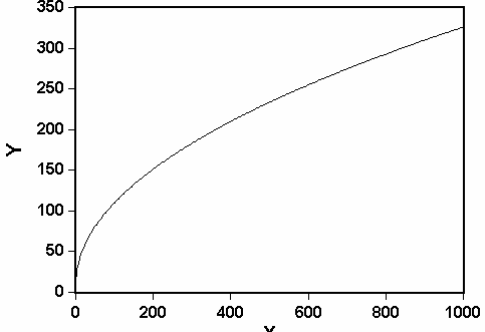
# Basic *FitAll* Function Library

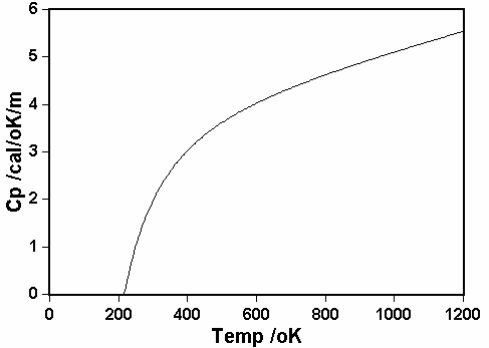
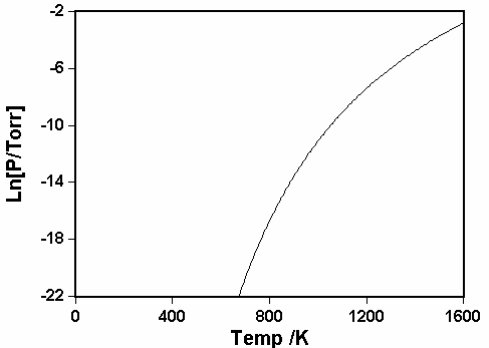
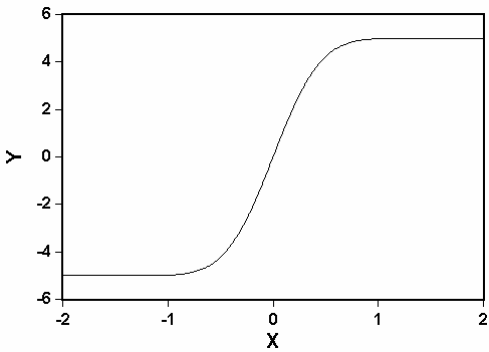
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0001	First Order Exponential with Background Correction  Number of variations: 4	$Y = P1 * e^{-(P2 * K1 * X)} + \sum_{i=0}^n (P3 + i * X^i)$ <p style="text-align: center;">for example,</p> $Y = P1 * e^{-(P2 * K1 * X)} + P3 + P4 * X$	<p>The top graph shows a decaying exponential curve starting at (0, 100) and approaching the x-axis as X increases to 500. The bottom graph shows an increasing curve starting near (0, 0) and rising to approximately (500, 9000).</p>

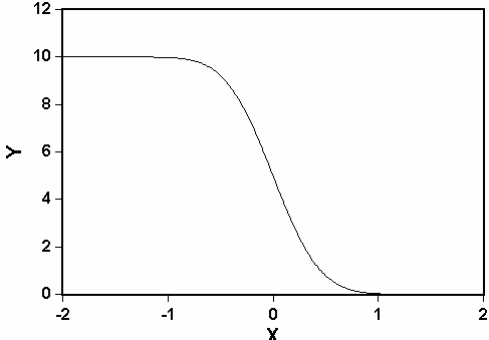
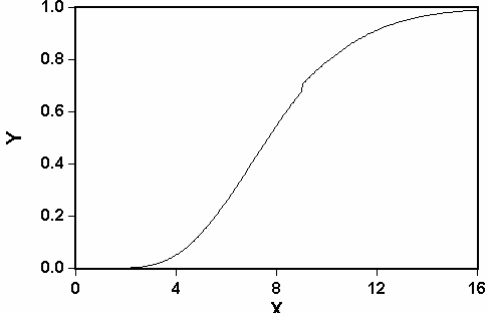
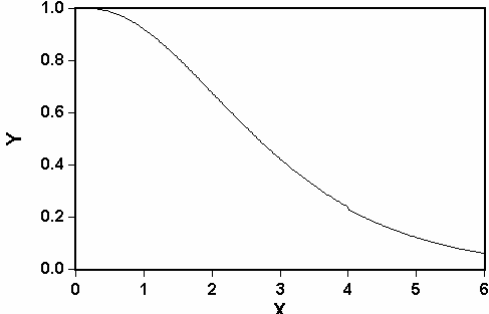
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0002	Sum of First Order Exponentials  Number of variations: 5	$Y = P1 + \sum_{i=1}^n \left[ P2i * e^{-(P2i+1 * Ki * X)} \right]$ <p>for example,</p> $Y = P1 + P2 * e^{-(P3 * K1 * X)} + P4 * e^{-(P5 * K2 * X)}$	
0003	Langmuir Adsorption Isotherm  Number of variations: 1	$Y = \frac{P1 * X}{(1 + P1 * X)}$	
0004	Saturation Curve, Non-zero origin  Number of variations: 1	$Y = \frac{(P1 + P2 * P3 * X)}{(1 + P2 * X)}$	

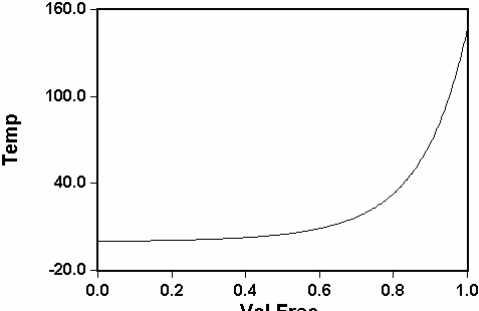
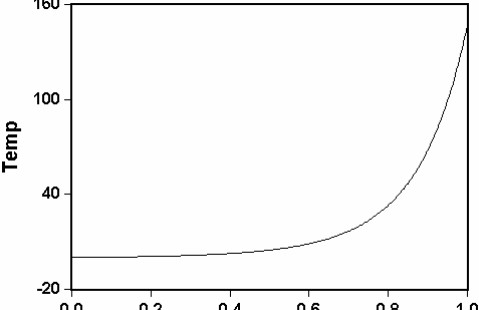
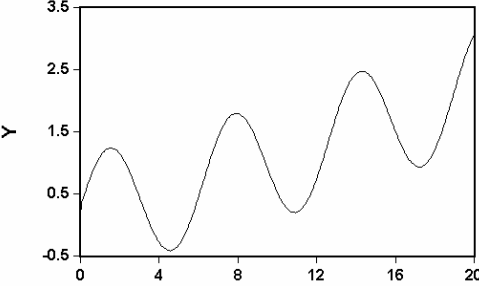
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0005	Gaussian With Offset Number of variations: 2	$Y = P1 * e^{-2.77 * \left(\frac{X - P2}{P3}\right)^2} + P4$	 <p>The graph shows a symmetric bell-shaped curve. The x-axis is labeled 'X' and ranges from 0 to 18 with major ticks at 0, 6, 12, and 18. The y-axis is labeled 'Y' and ranges from 0 to 100 with major ticks at 0, 20, 40, 60, 80, and 100. The curve starts near zero at X=0, reaches its maximum value of approximately 95 at X=10, and returns to near zero at X=18.</p>
0006	Lorentzian With Offset Number of variations: 2	$Y = \frac{P1 * P3^2}{4 * (X - P2)^2 + P3^2} + P4$	 <p>The graph shows a symmetric bell-shaped curve with a slightly heavier right tail than the Gaussian. The x-axis is labeled 'X' and ranges from 0 to 20 with major ticks at 0, 5, 10, 15, and 20. The y-axis is labeled 'Y' and ranges from 0 to 100 with major ticks at 0, 20, 40, 60, 80, and 100. The curve peaks at X=10 with a value of 100.</p>
0007	Poisson With Offset Number of variations: 2	$Y = P2 * e^{[X * \ln(P1) - P1 - \ln(X!)]} + P3$	 <p>The graph shows a smooth curve representing a Poisson distribution. The x-axis is labeled 'Count' and ranges from 0 to 25 with major ticks at 0, 5, 10, 15, 20, and 25. The y-axis is labeled 'Fraction' and ranges from 0.0 to 0.2 with major ticks at 0.0, 0.1, and 0.2. The curve peaks at a count of 14 with a fraction of approximately 0.11.</p>

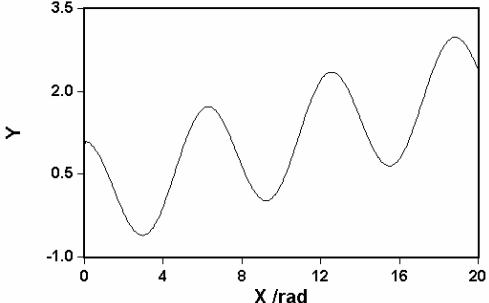
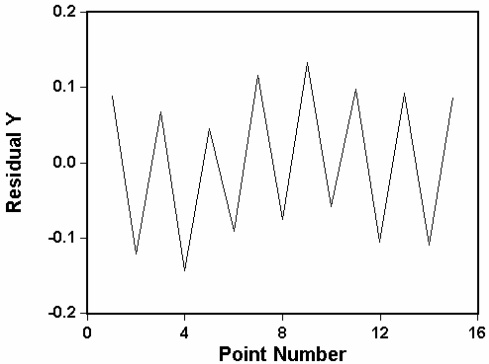
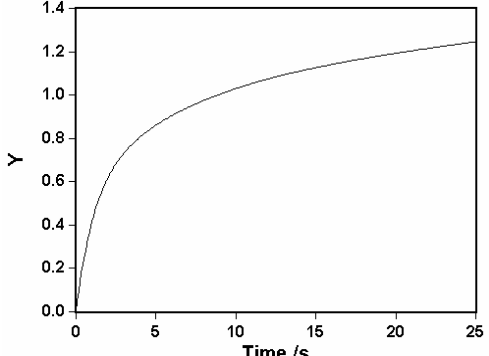
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0008	<p>Multiple Linear</p> <p>Number of variations: more than 100</p> <p>Note: The function used to generate the example graph has two independent variables, X1 and X2. The residual graph rather than the fit graph is displayed.</p>	$Y = P_0 + \sum_{i=1}^n P_i * X_i$ <p>for example,</p> $Y = P_0 + P_1 * X_1 + P_2 * X_2 + P_3 * X_3$	 <p>The graph shows the residuals of a multiple linear fit. The x-axis is labeled 'Point Number' and ranges from 0 to 16. The y-axis is labeled 'Residual Y' and ranges from -0.2 to 0.2. The residuals exhibit a clear periodic, sawtooth-like oscillation around the zero line.</p>
0009	<p>Power Curve</p> <p>Number of variations: 1</p>	$Y = P_1 * X^{P_2}$	 <p>The graph shows a power curve. The x-axis is labeled 'X' and ranges from 0 to 25. The y-axis is labeled 'Y' and ranges from 0 to 7000. The curve starts near the origin and increases exponentially, reaching a value of approximately 6000 at X=25.</p>
0010	<p>Rational Function</p> <p>Number of variations: more than 10</p>	$Y = \frac{P_{N0} + \sum_{i=1}^{n1} (P_{Ni} * X^i)}{1 + \sum_{j=1}^{n2} (P_{Dj} * X^j)}$ <p>for example,</p> $Y = \frac{P_{N0}}{(1 + P_{D1} * X)}$	 <p>The graph shows a rational function. The x-axis is labeled 'X' and ranges from -10 to 10. The y-axis is labeled 'Y / 1000' and ranges from -1.0 to 2.5. The curve is a hyperbola that decreases from a high value at X=-10 towards a value of -1.0 at X=10, passing through the y-axis at approximately 1.0.</p>

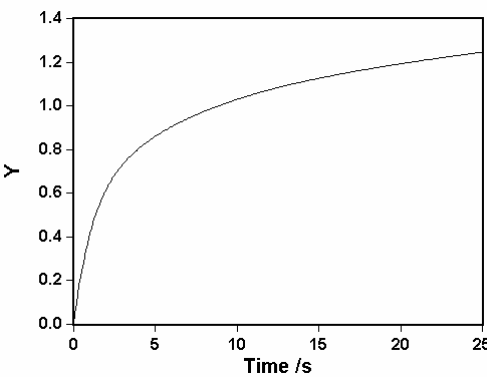
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0011	Polynomial_1  Number of variations: more than 10	$Y = \sum_i P_i * X^i, \text{ for } -10 \leq i \leq 10$ <p style="text-align: center;">for example,</p> $Y = P_0 + P_1 * X + P_2 * X^2$	
0012	Polynomial_2  Number of variations: more than 10	$Y = \sum_{i=1}^n (P_i *  X ^{K_i})$ <p style="text-align: center;">for example,</p> $Y = P_0 + P_1 *  X ^{-0.5} + P_2 * X$	
0012	Square Root  Number of variations: 1	$Y = P_1 + P_2 * \sqrt{ X }$	

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0014	$Y = P1 + P2 * X + P3 / X^2$ Number of variations: 1	$Y = P1 + P2 * X + \frac{P3}{X^2}$	
0015	$Y = P1 + P2 / X + P3 * \text{Ln} X $ Number of variations: 1	$Y = P1 + \frac{P2}{X} + P3 * \text{Ln} X $	
0016	Error Function (Erf) With Background Correction Number of variations: 4	$Y = P1 * \text{erf}(P2 * X) + P3 + P4 * X + P5 * X^2$	

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0017	Complementary Error Function With Background Correction  Number of variations: 4	$Y = P1 * \text{erfC}(P2 * X) + P3 + P4 * X + P5 * X^2$	
0018	Incomplete Gamma Function (GammaP) With Background Correction  Number of variations: 4	$Y = P1 * \text{GammaP}(P2, X) + P3 + P4 * X + P5 * X^2$	
0019	Complementary Incomplete Gamma Function (GammaQ) With Background Correction  Number of variations: 4	$Y = P1 * \text{GammaQ}(P2, X) + P3 + P4 * X + P5 * X^2$	

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0020	Boiling Curve_1 Number of variations: 1	$Y = e^{\left[ P1 * X^{K1} + P2 * X^{K2} \right] - 1}$	
0021	Boiling Curve_2 Number of variations: 1	$Y = e^{\left[ P1 * X^{P3} + P2 * X^{P4} \right] - 1}$	
0022	Sine With Background Correction Number of variations: 4	$Y = P1 * \sin(P2 * X + P3) + \sum_i A_i * X^i$	

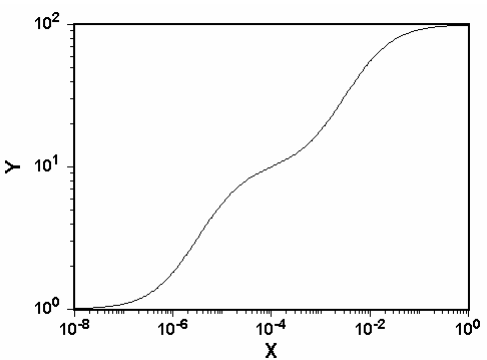
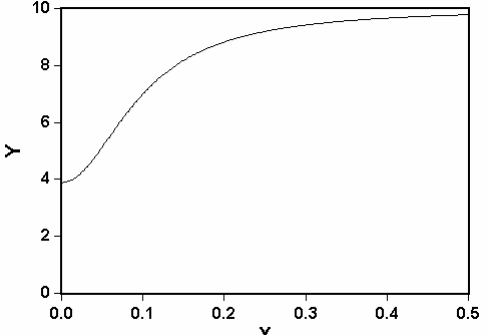
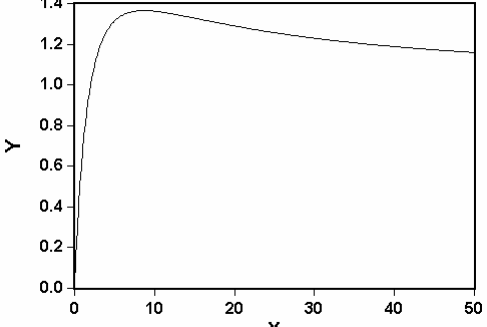
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0023	Cosine With Background Correction  Number of variations: 4	$Y = P1 * \text{Cos}(P2 * X + P3) + \sum_i A_i * X^i$	
0024	Multiple Linear_2 – <b>MULTI-FIT</b>  Number of variations: more than a <b>million</b>  Note: The function used to generate the example graph has three independent variables, X1, X2 and X3. The residual graph, rather than the fit graph, is displayed.	$Y = \sum_j P_j * X_{K(j)}$	
0025	<b>New in version 7</b>  Sum of Exponentials  Number of variations: 20  Note: Previously available only in the ST1 custom ffl.	$Y = P_1 * X + \sum_{j=1}^n \left[ P_{2j} * \left( 1 - e^{-P_{2j+1} * X} \right) \right]$ <p style="text-align: center;">or</p> $Y = P_1 * (X - X_0) + \sum_{j=1}^n \left[ P_{2j} * \left( 1 - e^{-P_{2j+1} * (X - X_0)} \right) \right]$	

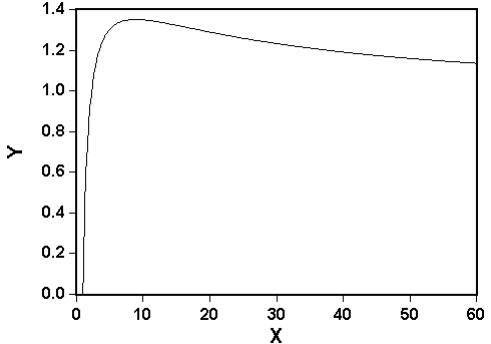
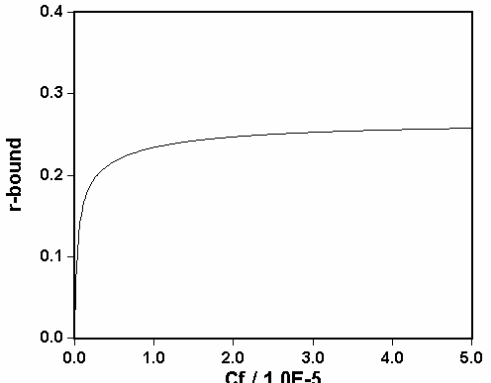
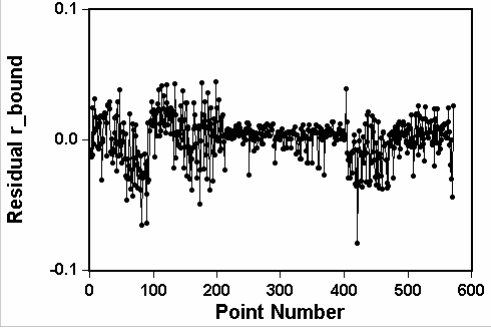
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0026	<p><b>New in version 7</b></p> <p>Sum of Exponentials</p> <p>Number of variations: 20</p> <p>Note: Previously available only in the ST1 custom ffl.</p>	$Y = \sum_{j=1}^n \left[ P_{2j-1} * \left( 1 - e^{-P_{2j} * X} \right) \right]$ <p style="text-align: center;">or</p> $Y = \sum_{j=1}^n \left[ P_{2j-1} * \left( 1 - e^{-P_{2j} * (X - X_0)} \right) \right]$	

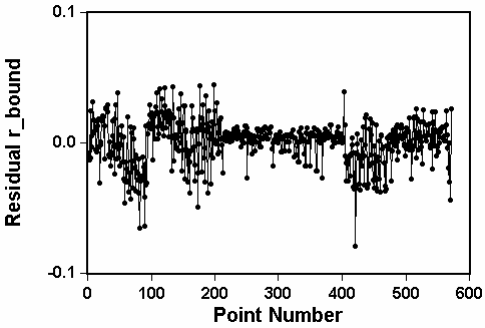
# Binding Curves

## FitAll Function Library

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0201	Langmuir Adsorption Isotherm  Number of variations: 1	$Y = \frac{P1 * X}{(1 + P1 * X)}$	
0202	Coupled Saturation Curves (Zero Origin)  Number of variations: 10	$Y = \frac{\sum_{i=1}^n \left( X^i * P_{2i} * \prod_{j=1}^i P_{2j-1} \right)}{1 + \sum_{i=1}^n \left( X^i * \prod_{j=1}^i P_{2j-1} \right)}$ <p style="text-align: center;">for example,</p> $Y = \frac{(P1 * P2 * X + P1 * P3 * P4 * X^2)}{(1 + P1 * X + P1 * P3 * X^2)}$	

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0203	Coupled Saturation Curves (Non Zero Origin)  Number of variations: 10	$Y = \frac{P1 + \sum_{i=1}^n \left( X^i * P_{2i+1} * \prod_{j=1}^i P_{2j} \right)}{1 + \sum_{i=1}^n \left( X^i * \prod_{j=1}^i P_{2j} \right)}$ <p style="text-align: center;">for example,</p> $Y = \frac{(P1 + P2 * P3 * X + P2 * P4 * P5 * X^2)}{(1 + P2 * X + P2 * P4 * X^2)}$	
0204	Cooperative Saturation Curve  Number of variations: 1	$Y = \frac{(P3 + P2 * P1 * X^{P4})}{(1 + P1 * X^{P4})}$	
0205	Uncoupled Saturation Curves (Zero Origin)  Number of variations: 10	$Y = \sum_{i=1}^n \left( \frac{P_{2i-1} * P_{2i} * X}{[1 + P_{2i-1} * X]} \right)$ <p style="text-align: center;">for example,</p> $Y = \frac{P1 * P2 * X}{(1 + P1 * X)} + \frac{P3 * P4 * X}{(1 + P3 * X)}$	

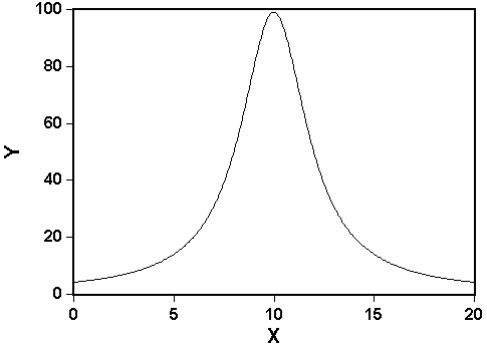
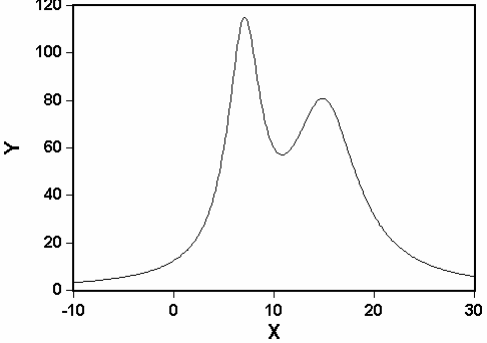
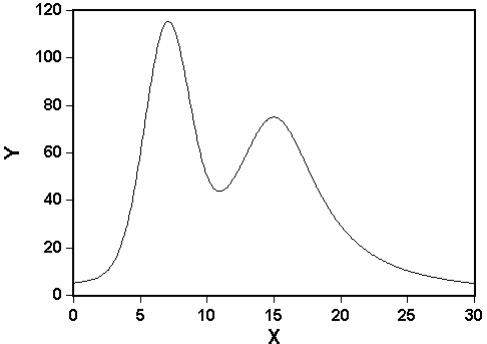
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0206	Uncoupled Saturation Curves (Non zero Origin)  Number of variations: 10	$Y = P_1 + \sum_{i=1}^n \left( \frac{P_{2i} * P_{2i+1} * X}{1 + P_{2i} * X} \right),$ <p style="text-align: center;">for example,</p> $Y = P_1 + \frac{(P_2 * P_3 * X)}{(1 + P_2 * X)} + \frac{(P_4 * P_5 * X)}{(1 + P_4 * X)}$	
0207	DNA-DRUG Binding: Multi-Site, Single Experiment; f's as parameters  Number of variations: 10  Note: Previously available only in the JC2 custom edition.	$Y = \frac{1}{2} * \sum_{j=1}^n \left( \frac{ P_{2j-1}  *  P_{2j}  * X}{1 +  P_{2j-1}  * X} \right)$	
0208	DNA-DRUG Binding: Multi-Site, Multi-Experiment; f's as independent variables  Number of variations: Several million.  Notes: 1. Residuals graph is shown. 2. Previously available only in the JC2 custom edition.	$Y = \frac{1}{2} * \sum_{j=1}^n \left( \frac{A_j *  P_j  * X}{1 +  P_j  * X} \right)$ <p style="text-align: center;">for example,</p> $Y = \frac{A_1 *  P_1  * X}{2 * (1 +  P_1  * X)} + \frac{A_2 *  P_2  * X}{2 * (1 +  P_2  * X)}$	

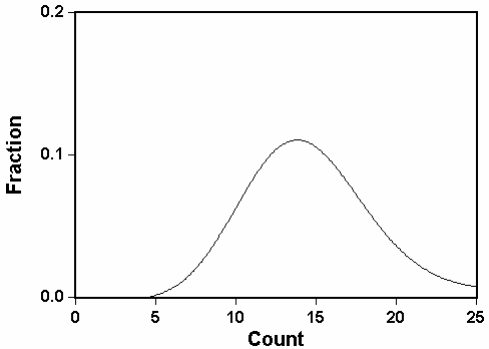
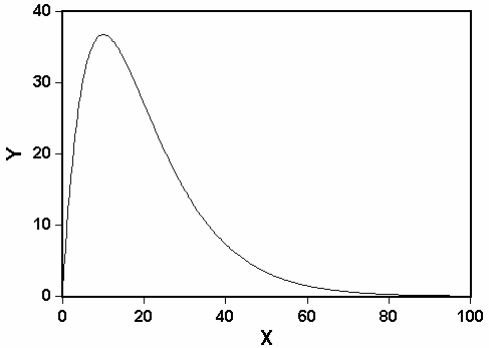
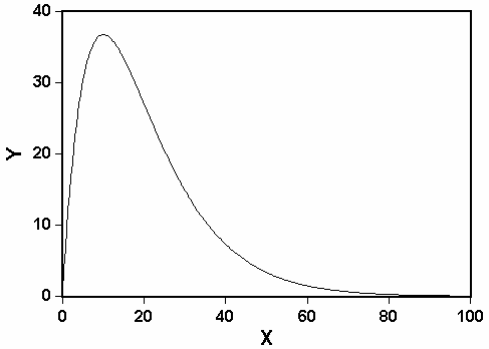
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0209	<p>DNA-DRUG Binding: Multi-Site, Multi-Experiment; f's as constants</p> <p>Number of variations: Several million.</p> <p>Notes: 1. Residuals graph is shown. 2. Previously available only in the JC2 custom edition.</p>	$Y = \frac{1}{2} * \sum_{j=1}^n \left( \frac{A_j *  P_j  * X}{[1 +  P_j  * X]} \right)$ <p>for example,</p> $Y = \frac{A1 *  P1  * X}{2 * (1 +  P1  * X)} + \frac{A2 *  P2  * X}{2 * (1 +  P2  * X)}$	

# Peaks

## FitAll Function Library

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0301	Gaussian With Background Correction  Number of variations: 4	$Y = P1 * e^{-2.77 * \left(\frac{(X - P2)}{P3}\right)^2} + \sum_{i=0} A_i * X^i$ <p style="text-align: center;">for example,</p> $Y = P1 * e^{-2.77 * \left(\frac{(X - P2)}{P3}\right)^2} + P4 + P5 * X$	
0302	Sum of Gaussians With Background Correction  Number of variations: 20	$Y = \sum_{i=1}^n \left[ P_{3i-2} * e^{-2.77 * \left(\frac{(X - P_{3i-1})}{P_{3i}}\right)^2} \right] + \sum_{j=0}^{n2} (P_{3n+1+j} * X^j)$ <p style="text-align: center;">for example,</p> $Y = P1 * e^{-2.77 * \left(\frac{(X - P2)}{P3}\right)^2} + P4 * e^{-2.77 * \left(\frac{(X - P5)}{P6}\right)^2}$	

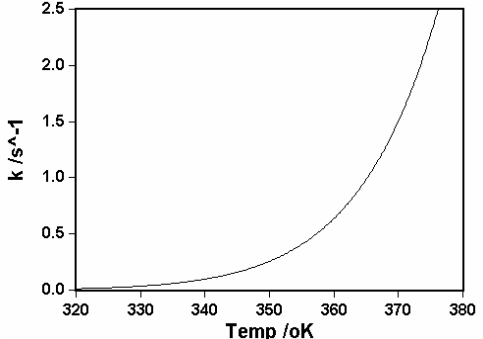
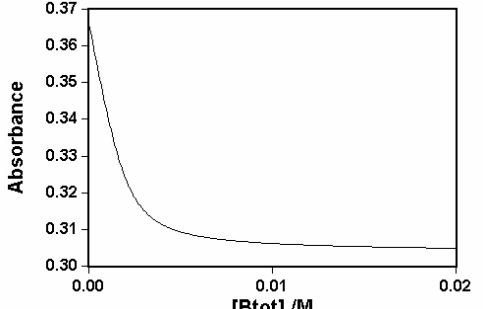
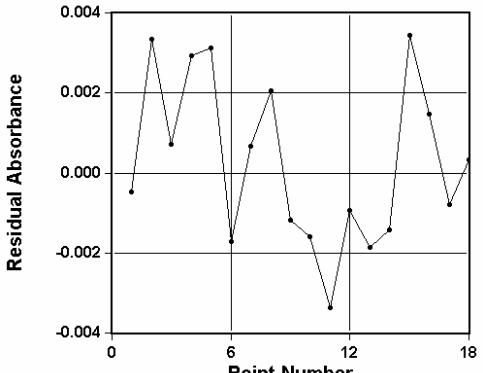
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0303	Lorentzian With Background Correction  Number of variations: 4	$Y = \frac{P1 * P3^2}{[4 * (X - P2)^2 + P3^2]} + \sum_i A_i * X^i$ <p style="text-align: center;">for example,</p> $Y = \frac{P1 * P3^2}{[4 * (X - P2)^2 + P3^2]} + P4 + P5 * X + P6 * X^2$	
0304	Sum of Lorentzians With Background Correction  Number of variations: 20	$Y = \sum_{i=1}^n \left( \frac{P_{3i-2} * P_{3i}^2}{[4 * (X - P_{3i-1})^2 + P_{3i}^2]} \right) + \sum_{j=0}^{n2} (P_{3n+1+j} * X^j)$ <p style="text-align: center;">for example,</p> $Y = \frac{P1 * P3^2}{[4 * (X - P2)^2 + P3^2]} + \frac{P4 * P6^2}{[4 * (X - P5)^2 + P6^2]}$	
0305	Sum of Gaussians and Lorentzians With Background Correction  Number of variations: > 20	<p style="text-align: center;">The simplest form of the function is:</p> $Y = P1 * e^{\left[ -2.77 * \left( \frac{X - P2}{P3} \right)^2 \right]} + \frac{P4 * P6^2}{[4 * (X - P5)^2 + P6^2]}$	

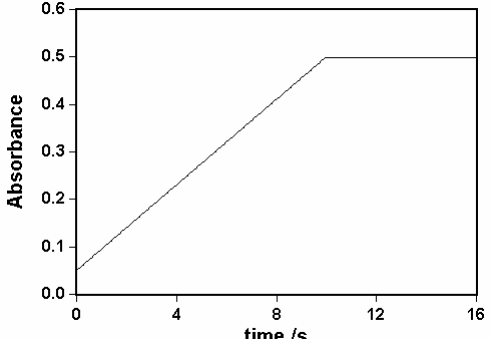
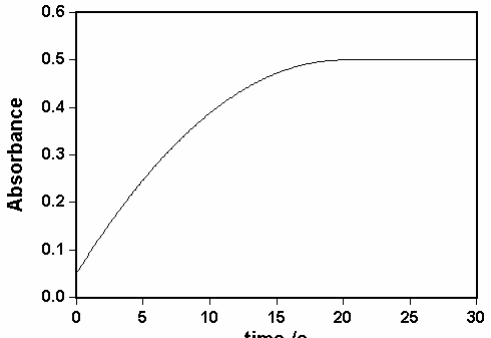
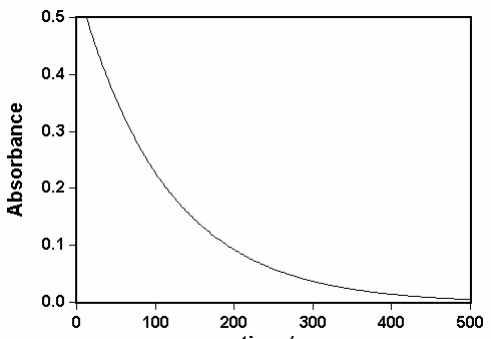
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0306	Poisson With Background Correction  Number of variations: 4	$Y = P2 * e^{[X * \text{Ln}(P1) - P1 - \text{Ln}(X!)]} + \sum_{i=0}^n (A_i * X^i)$ <p style="text-align: center;">for example,</p> $Y = P2 * e^{[X * \text{Ln}(P1) - P1 - \text{Ln}(X!)]} + P3 + P4 * X$	
0307	Impulse: Linear or exponential Growth Coupled with Exponential Decay  Number of variations: 12.	$Y = P1 * (X - P3)^{P4} * e^{[-P2 * K1 * (X - P3)]} + \sum_{i=0}^n (A_i * X^i)$ <p style="text-align: center;">for example,</p> $Y = P1 * (X - P3)^{P4} * e^{[-P2 * K1 * (X - P3)]}$	
0308	Impulse_2: Linear or exponential Growth Coupled with Exponential Decay  Same as function 0307 except that parameter P3, the X offset, is assumed to be zero.  Number of variations: 8.	$Y = P1 * X^{P3} * e^{[-P2 * K1 * X]} + \sum_{i=0}^n (A_i * X^i)$ <p style="text-align: center;">for example,</p> $Y = P1 * X^{P3} * e^{[-P2 * K1 * X]}$	

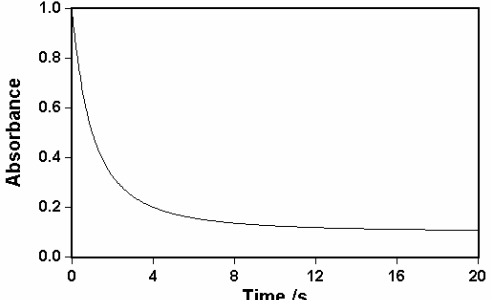
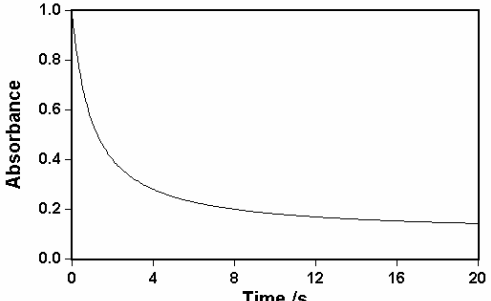
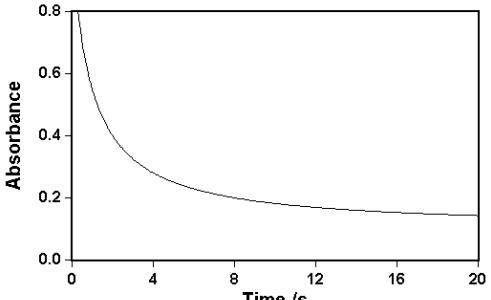
# Chemistry

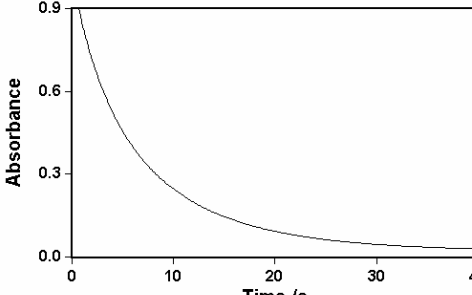
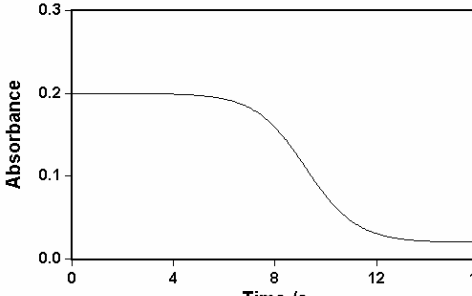
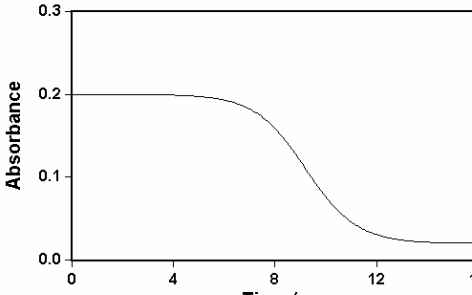
## FitAll Function Library

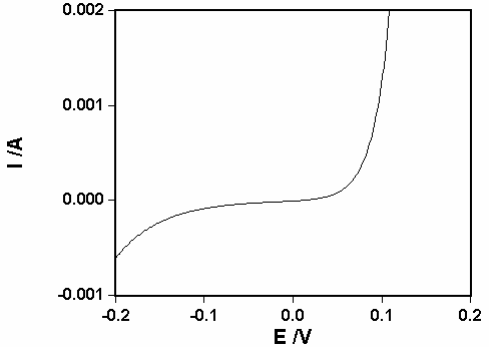
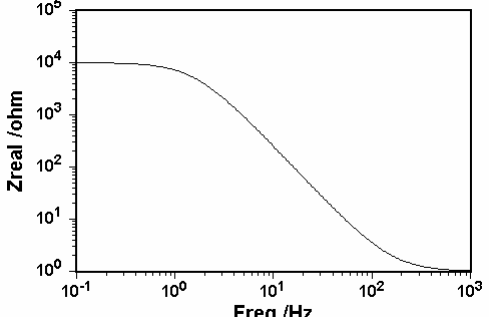
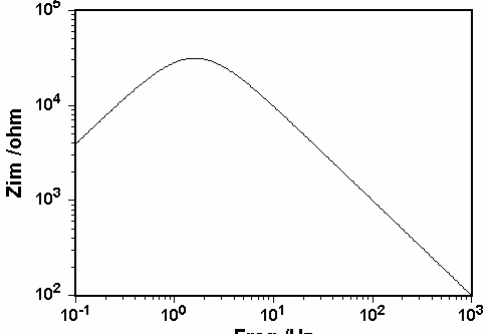
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0401	Michaelis-Menton Kinetics  Number of variations: 3	$Y = \frac{P1 * X}{(P2 + X)}$ <p style="text-align: center;">or</p> $Y = \frac{P1 * X}{(P2 + X)} + \frac{P3 * X}{(P4 + X)}$	
0402	Arrhenius Activation Energy  Number of variations: 1	$Y = P1 * e^{\left[ \frac{-P2}{(K1 * X)} \right]}$	
0403	Activation Enthalpy and Entropy  Number of variations: 1	$Y = K1 * X * e^{\left[ \frac{-P1}{(K2 * X)} + \frac{P2}{K2} \right]}$	

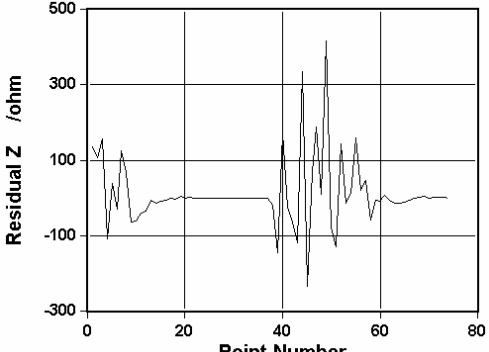
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0404	Equilibrium Enthalpy and Entropy  Number of variations: 1	$Y = e^{\left[ \frac{-P1}{(K1 * X)} + \frac{P2}{K1} \right]}$	 <p>A line graph showing the relationship between the rate constant k (in s<sup>-1</sup>) and temperature (in °K). The x-axis ranges from 320 to 380 °K, and the y-axis ranges from 0.0 to 2.5 s<sup>-1</sup>. The curve shows an exponential increase in k as temperature increases.</p>
0405	Reversible Chemical Equilibrium_1: A + B = C, X1 = Btot, K1 = Atot  Number of variations: 3	$Y = P2 * \left\{ \frac{P1 * (K1 + X1) + 1 - \sqrt{\left[ \left( P1 * (K1 + X1) + 1 \right)^2 - 4 * P1^2 * K1 * X1 \right]}}{2 * P1} \right\}$	 <p>A line graph showing Absorbance versus [Btot] / M. The x-axis ranges from 0.00 to 0.02 M, and the y-axis ranges from 0.30 to 0.37. The curve shows a decreasing trend in absorbance as [Btot] increases, starting at approximately 0.365 at 0.00 M and leveling off around 0.31 at 0.02 M.</p>
0406	Reversible Chemical Equilibrium_2: A + B = C, X1 = Btot, X2 = Atot  Number of variations: 3  Note: This function has two independent variables, X1 and X2.	$Y = P2 * \left\{ \frac{P1 * (X2 + X1) + 1 - \sqrt{\left[ \left( P1 * (X2 + X1) + 1 \right)^2 - 4 * P1^2 * X2 * X1 \right]}}{2 * P1} \right\}$	 <p>A line graph showing Residual Absorbance versus Point Number. The x-axis ranges from 0 to 18, and the y-axis ranges from -0.004 to 0.004. The plot shows a fluctuating line with several peaks and troughs, indicating the residuals of a fit.</p>

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0407	Chemical Kinetics: Zero-Order Rxn: $A \rightarrow B$ , $-dA/dt = k$  Number of variations: 2	$Y = \begin{cases} P2 * K1, & \text{for } X < 0 \\ P2 * K1 + (P3 - P2) * P1 * X, & \text{for } 0 \leq X \leq \frac{K1}{P1} \\ P3 * K1, & \text{for } X > \frac{K1}{P1} \end{cases}$	
0408	Chemical Kinetics: Half-Order Rxn: $A \rightarrow B$ , $dA/dt = k * A^{(1/2)}$  Number of variations: 2	$Y = \begin{cases} P2 * K1, & \text{for } X < 0 \\ P2 * K1 + (P3 - P2) * P1 * X * \frac{4 * \sqrt{K1} - P1 * X}{4}, & \text{for } 0 \leq X \leq \frac{2 * \sqrt{K1}}{P1} \\ P3 * K1, & \text{for } X > \frac{2 * \sqrt{K1}}{P1} \end{cases}$	
0409	Chemical Kinetics: First-Order Rxn: $A \rightarrow B$ , $dA/dt = k * A$  Number of variations: 2	$Y = K1 * [P2 + (P3 - P2) * (1 - e^{-P1 * X})]$ <p style="text-align: center;">or</p> $Y = K1 * P2 * e^{-P1 * X}$	

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0410	Chemical Kinetics: (3/2)-Order Rxn: $A \rightarrow B$ , $dA/dt = k \cdot A^{(3/2)}$  Number of variations: 2	$Y = K1 \cdot P2 + (P3 - P2) \cdot K1 \cdot \left( 1 - \frac{4}{(2 + P1 \cdot \sqrt{K1} \cdot X)^2} \right)$	
0411	Chemical Kinetics: Second-Order (equal) Rxn_1: $A \rightarrow B$ , $dA/dt = k \cdot A^2$  Number of variations: 2	$Y = K1 \cdot P2 + \frac{(P3 - P2) \cdot P1 \cdot K1^2 \cdot X}{(1 + P1 \cdot K1 \cdot X)}$	
0412	Chemical Kinetics: Second-Order (equal) Rxn_2: $2A \rightarrow B$ , $dA/dt = k \cdot A^2$  Number of variations: 2	$Y = K1 \cdot P2 - \frac{P2 \cdot P1 \cdot K1^2 \cdot X}{(1 + P1 \cdot K1 \cdot X)}$	

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0413	Chemical Kinetics: Second-Order (unequal) Rxn: $A + B \rightarrow C$ , $dA/dt = k \cdot A \cdot B$  Number of variations: 2	$Y = K1 \cdot P2 + K2 \cdot P3 - \frac{(P3 + P2) \cdot K1 \cdot K2 \cdot [1 - e^{(K2 - K1) \cdot P1 \cdot X}]}{K1 - K2 \cdot e^{(K2 - K1) \cdot P1 \cdot X}}$	
0414	Chemical Kinetics: Autocatalysis_1: $A \rightarrow B$ , $dA/dt = k \cdot A \cdot B$ , Bo Known  Number of variations: 2	$Y = K1 \cdot P2 - \frac{P2 \cdot K1 \cdot K2 \cdot \left(1 - e^{[(K2 - K1) \cdot P1 \cdot X]}\right)}{K2 + K1 \cdot e^{[(K2 - K1) \cdot P1 \cdot X]}}$	
0415	Chemical Kinetics: Autocatalysis_2: $A \rightarrow B$ , $dA/dt = k \cdot A \cdot B$ , Bo UnKnown  Number of variations: 2	$Y = K1 \cdot P3 - \frac{P3 \cdot K1 \cdot P2 \cdot \left(1 - e^{[(P2 - K1) \cdot P1 \cdot X]}\right)}{P2 + K1 \cdot e^{[(P2 - K1) \cdot P1 \cdot X]}}$	

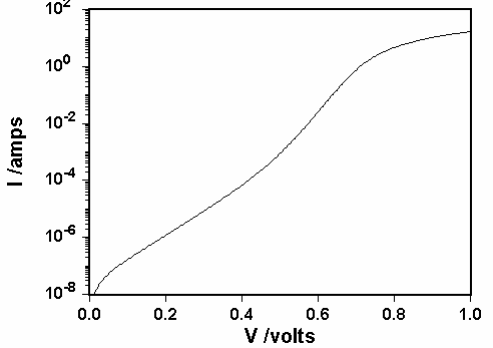
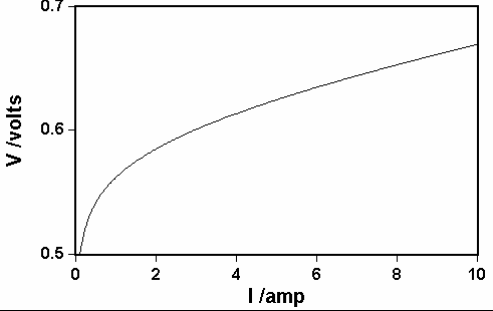
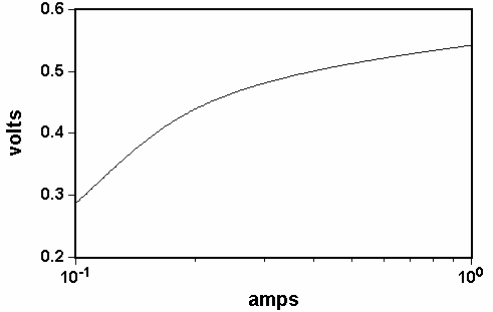
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0416	Current - Over Potential Number of variations: 2	$Y = P1 * \left\{ e^{\left[ \frac{K1 * (X - P4)}{P2} \right]} - e^{\left[ \frac{-K1 * (X - P4)}{P3} \right]} \right\}$ <p style="text-align: center;">or</p> $Y = P1 * \left\{ e^{\left[ \frac{K1 * (X - P4 - Y * P5)}{P2} \right]} - e^{\left[ \frac{-K1 * (X - P4 - Y * P5)}{P3} \right]} \right\}$	
0417	Real Impedance of a Parallel RC+Rs Circuit Number of variations: 2	$Y = \frac{P1}{\left[ 1 + (2 * \pi * P1 * P2 * X)^2 \right]}$ <p style="text-align: center;">or</p> $Y = \frac{P1}{\left[ 1 + (2 * \pi * P1 * P2 * X)^2 \right]} + P3$	
0418	Imaginary Impedance of a Parallel RC or RC+Rs Circuit Number of variations: 1	$Y = \frac{-(2 * \pi * P1)^2 * P2 * X}{\left[ 1 + (2 * \pi * P1 * P2 * X)^2 \right]}$	

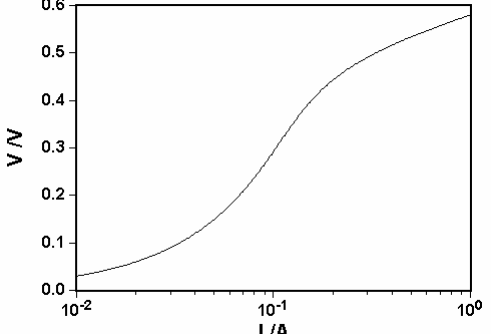
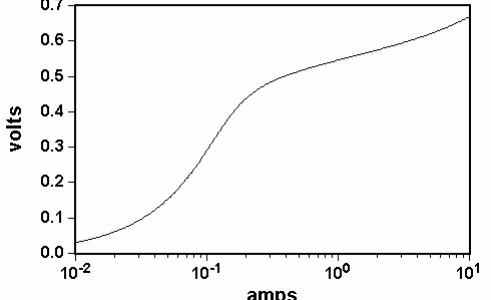
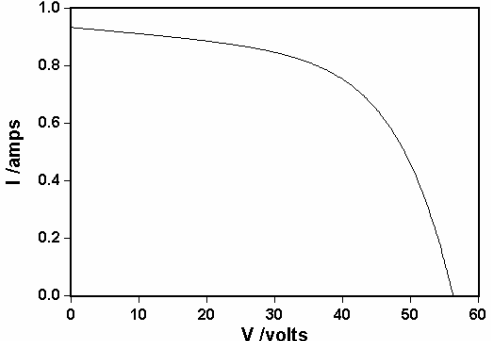
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Graph
0419	<p>Real and Imaginary Impedance of a Parallel RC+Rs Circuit</p> <p>Number of variations: 2</p> <p>Note: This function has two independent variables, X1 and X2.</p>	$Y = \begin{cases} \frac{P1}{1 + (2 * \pi * P1 * P2 * X1)^2} + P3, & \text{for } X2 = 0 \\ \frac{-(2 * \pi * P1)^2 * P2 * X1}{1 + (2 * \pi * P1 * P2 * X1)^2}, & \text{for } X2 \neq 0 \end{cases}$	

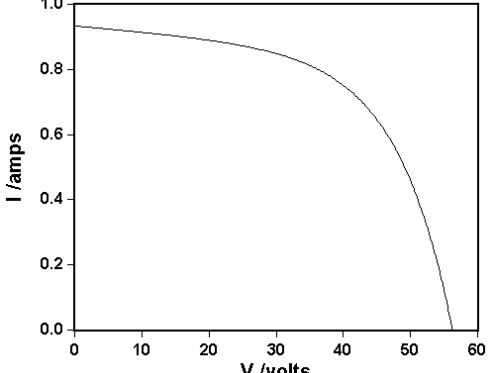
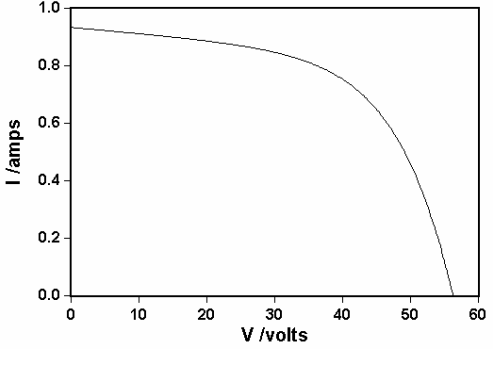
# Solar Cell

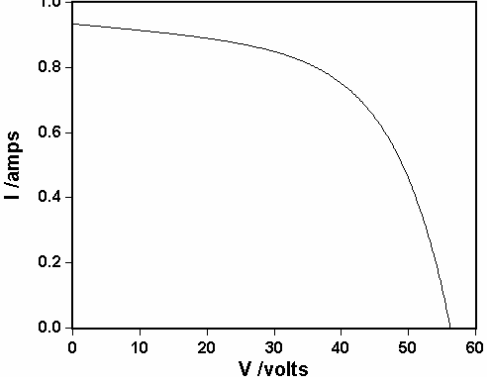
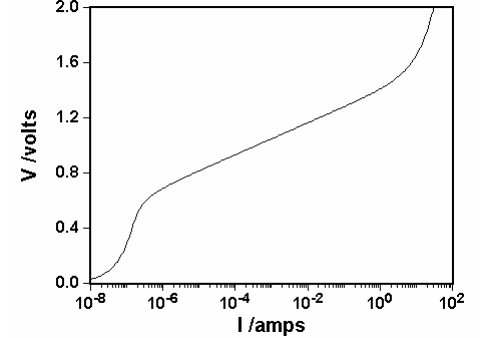
## FitAll Function Library

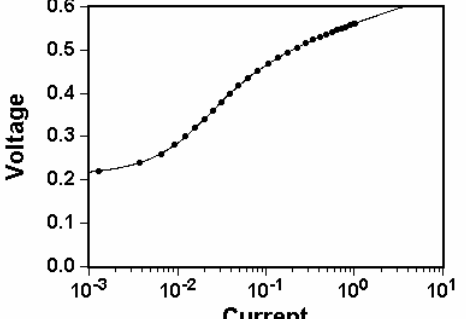
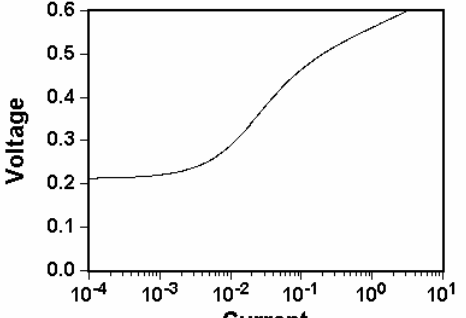
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Fit Graph
0501	Solar Cell: Dark Current-Voltage: Ideal  Number of variations: 2	$Y = P2 * \left\{ e^{\left[ \frac{K1 * X}{(273.15 + K2)} \right] - 1} \right\} + \frac{X}{P1}$ <p style="text-align: center;">or</p> $Y = P2 * \left\{ e^{\left[ \frac{K1 * (X - Y * P3)}{(273.15 + K2)} \right] - 1} \right\} + \frac{(X - Y * P3)}{P1}$	
0502	Solar Cell: Dark Current-Voltage: Non-Ideal  Number of variations: 2	$Y = P2 * \left\{ e^{\left[ \frac{K1 * X}{((273.15 + K2) * P3)} \right] - 1} \right\} + \frac{X}{P1}$ <p style="text-align: center;">or</p> $Y = P2 * \left\{ e^{\left[ \frac{K1 * (X - Y * P4)}{((273.15 + K2) * P3)} \right] - 1} \right\} + \frac{(X - Y * P4)}{P1}$	

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Fit Graph
0503	Solar Cell: Dark Current-Voltage: Sum of Ideal and Non-Ideal:  Number of variations: 2	$Y = P2 * \left\{ e^{\left[ \frac{K1 * X}{(273.15 + K2)} \right] - 1} \right\} + P3 * \left\{ e^{\left[ \frac{K1 * X}{(273.15 + K2) * P4} \right] - 1} \right\} + \frac{X}{P1}$ <p style="text-align: center;">or</p> $Y = P2 * \left\{ e^{\left[ \frac{K1 * (X - Y * P5)}{(273.15 * K2)} \right] - 1} \right\} + P3 * \left\{ e^{\left[ \frac{K1 * (X - Y * P5)}{((273.15 + K2) * P4)} \right] - 1} \right\} + \frac{(X - Y * P5)}{P1}$	
0504	Solar Cell: Dark I-V: Model 1: High I-range  Number of variations: 1	$Y = \frac{K3 * (273.15 + K2)}{K1} * \ln \left  \frac{(X + P1)}{P1} \right  + X * P2$	
0505	Solar Cell: Dark I-V: Model 2: Mid I-range  Number of variations: 1	$Y = P1 * \left( X - P2 * \left\{ e^{\left[ \frac{K1 * Y}{(273.15 + K2)} \right] - 1} \right\} - P3 * \left\{ e^{\left[ \frac{K1 * Y}{(P4 * (273.15 + K2))} \right] - 1} \right\} \right)$	

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Fit Graph
0506	Solar Cell: Dark I-V: Model 3: Low I-range  Number of variations: 1	$Y = P1 * \left( X - P2 * \left\{ e^{-\left[ \frac{K1 * Y}{(P3 * (273.15 + K2))} \right] - 1} \right\} \right)$	
0507	Solar Cell: Dark I-V: Model 4: Full I-range  Number of variations: 1	$Y = P1 * \left( X - P2 * \left\{ e^{-\left[ \frac{K1 * (Y - X * P5)}{(273.15 + K2)} \right] - 1} \right\} - P3 * \left\{ e^{-\left[ \frac{K1 * (Y - X * P5)}{(P4 * (273.15 + K2))} \right] - 1} \right\} + X * P5 \right)$	
0508	Solar Cell: Light I-V: 2 Parameters & 6-Constants  Number of variations: 1  Note: Previously available only in the DK2 custom edition.	$Y = K4 * \{A\} + [(K4 * P2 - K3) * \{A\} + K3 - X - Y * P2] * \left[ \frac{K6 - K4 * \{B\}}{(K4 * P2 - K3) * \{B\} + K3 - K5 - K6 * P2} \right]$ <p style="text-align: center;">in which</p> $A = \frac{e^{k_o * K3} - e^{k_o * (X + Y * P2)}}{e^{k_o * K3} - e^{k_o * K4 * P2}}$ $B = \frac{e^{k_o * K3} - e^{k_o * (K5 + K6 * P2)}}{e^{k_o * K3} - e^{k_o * K4 * P2}}$ $k_o = \frac{K1}{P1 * (273.15 + K2)}$	

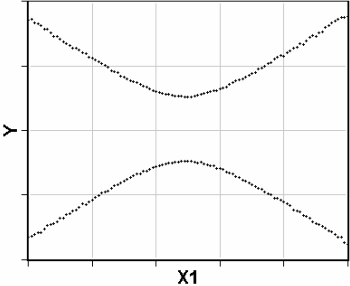
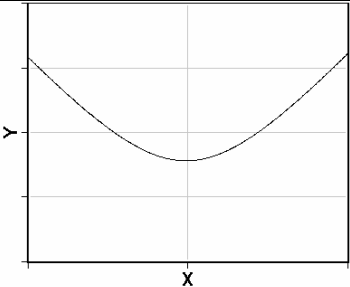
Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Fit Graph
0509	Solar Cell: Light I-V: 2 Parameters & 4-Constants; Rs=0  Number of variations: 1  Note: Previously available only in the DK2 custom edition.	$Y = K4 * \{A\} + [(-K3) * \{A\} + K3 - X] / P2$ <p style="text-align: center;">in which</p> $A = \frac{e^{k_o * K3} - e^{k_o * X}}{e^{k_o * K3} - 1},$ $k_o = \frac{K1}{P1 * (273.15 + K2)}$	
0510	Solar Cell: Light I-V: 6 Parameters & 2 Constants  Number of variations: 1	$Y = P4 * \{A\} + [(P4 * P2 - P3) * \{A\} + P3 - X - Y * P2] * \left[ \frac{P6 - P4 * \{B\}}{(P4 * P2 - P3) * \{B\} + P3 - P5 - P6 * P2} \right]$ <p style="text-align: center;">in which</p> $A = \frac{e^{k_o * P3} - e^{k_o * (X + Y * P2)}}{e^{k_o * P3} - e^{k_o * P4 * P2}},$ $B = \frac{e^{k_o * K3} - e^{k_o * (P5 + P6 * P2)}}{e^{k_o * P3} - e^{k_o * P4 * P2}},$ $k_o = \frac{K1}{P1 * (273.15 + K2)}$	

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Fit Graph
0511	Solar Cell: Light I-V: 4 Parameters & 2 Constants; Rs=0  Number of variations: 1	$Y = P4 * \{A\} + [(- P3) * \{A\} + P3 - X]/P2$ <p style="text-align: center;">in which</p> $A = \frac{e^{k_o * P3} - e^{k_o * X}}{e^{k_o * P3} - 1},$ $k_o = \frac{K1}{P1 * (273.15 + K2)}$	
0512	Solar Cell: Dark Current-Voltage: Non-Ideal  Number of variations: 2	Same as function 0502 except that the definitions of the dependent and independent variables are switched. That is, the meanings of X and Y are interchanged. $Y = P1 * \left( X - P2 * \left\{ e^{\left[ \frac{K1 * (Y - X * P4)}{P3 * (273.15 + K2)} \right]} - 1 \right\} \right) + X * P4$	
0514	Solar Cell: Dark I-V: Model 1: High I-range  Number of variations: 1	Same as function 0504 except that the diode's ideality factor is treated as a parameter rather than as an adjustable constant.	
0515	Solar Cell: Dark I-V: Model 2: Mid I-range  Number of variations: 1	Same as function 0505 except that both diodes in the equivalent circuit are assumed to be non-ideal and their ideality factors are treated as parameters.	
0517	Solar Cell: Dark I-V: Model 4: Full I-range  Number of variations: 1	Same as function 0507 except that both diodes in the equivalent circuit are assumed to be non-ideal and their ideality factors are treated as parameters.	

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Fit Graph
0525	Solar Cell: Dark I-V: Model 2C: Mid I-range w/ Voltage Offset  Number of variations: 1	Similar to function 0505 except that an extra parameter, Voffset (P5), has been added to compensate for a possible measurement instrument calibration issue.  $Y = P1 * \left( X - P2 * \left\{ e^{\left[ \frac{K1 * (Y - P5)}{273.15 + K2} \right]} - 1 \right\} - P3 * \left\{ e^{\left[ \frac{K1 * (Y - P5)}{P4 * (273.15 + K2)} \right]} - 1 \right\} \right) + P5$	
0527	Solar Cell: Dark I-V: Model 4C: Full I-range w/ Voltage Offset Number of variations: 1	Similar to function 0507 except that an extra parameter, Voffset (P6), has been added to compensate for a possible measurement instrument calibration issue.  $Y = P1 * \left( X - P2 * \left\{ e^{\left[ \frac{K1 * ((Y - P6) - X * P5)}{273.15 + K2} \right]} - 1 \right\} - P3 * \left\{ e^{\left[ \frac{K1 * ((Y - P6) - X * P5)}{P4 * (273.15 + K2)} \right]} - 1 \right\} \right) + X * P5 + P6$	

# User Requested Functions

## FitAll Function Library

Ftn#	Function Name / Description	Function Definition [Equation (General Form and/or an Example)]	Example Fit Graph
1527 1528 1529 1530	<p>Hyperbola</p> <p>Both branches of the North-South oriented hyperbola are analyzed at the same time.</p> <p>These functions differ in which of the X and Y offset parameters are included in the analysis.</p> <p>These functions contain two independent variables, X1 and X2.</p>	$Y = \begin{cases} P3 + \frac{P1 * \sqrt{P2^2 + (X1 - P4)^2}}{P2}, & \text{for } X2 = 0 \\ P3 - \frac{P1 * \sqrt{P2^2 + (X1 - P4)^2}}{P2}, & \text{for } X2 \neq 0 \end{cases}$	
1537 1538 1539 1540	<p>Hyperbola</p> <p>The North-facing branch of a North-South oriented hyperbola.</p> <p>These functions contain two independent variables, X1 and X2.</p>	$Y = P3 + \frac{P1 * \sqrt{P2^2 + (X - P4)^2}}{P2}$	
1547 1548 1549 1550	<p>Hyperbola</p> <p>The South-facing branch of a North-South oriented hyperbola.</p> <p>These functions contain two independent variables, X1 and X2.</p>	$Y = P3 - \frac{P1 * \sqrt{P2^2 + (X - P4)^2}}{P2}$	