3 Function Curve Fit

All Data

x	y
0.0923	$3.39 \cdot 10^6$
0.196	$3.05 \cdot 10^6$
0.350	$2.48 \cdot 10^6$
0.478	$1.97 \cdot 10^6$
0.584	$1.48 \cdot 10^6$
0.680	$1.09 \cdot 10^6$
0.770	$7.20 \cdot 10^5$
0.852	$3.60 \cdot 10^5$
0.890	$1.46 \cdot 10^5$
0.930	$1.5 \cdot 10^3$
0.952	$6.6 \cdot 10^0$
0.972	$3.5 \cdot 10^{-2}$
0.980	$3.5 \cdot 10^{-4}$
0.986	10^{-7}

Low Data - Polynomial

$x1$	$y1$
0.0923	$3.39 \cdot 10^6$
0.196	$3.05 \cdot 10^6$
0.350	$2.48 \cdot 10^6$
0.478	$1.97 \cdot 10^6$
0.584	$1.48 \cdot 10^6$
0.680	$1.09 \cdot 10^6$
0.770	$7.20 \cdot 10^5$
0.852	$3.60 \cdot 10^5$
0.890	$1.46 \cdot 10^5$
0.930	$1.5 \cdot 10^3$

Middle Data - Gaussian

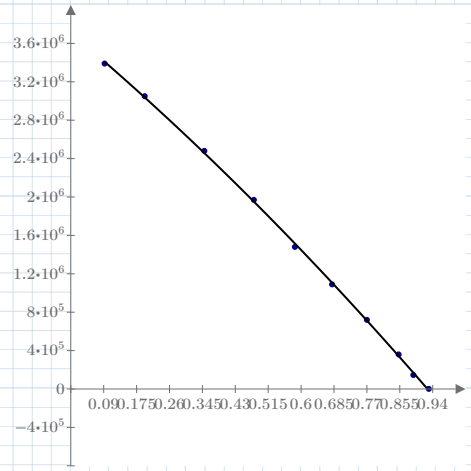
$xmid$	$ymid$
0.890	$1.46 \cdot 10^5$
0.930	$1.5 \cdot 10^3$
0.952	$6.6 \cdot 10^0$

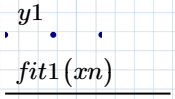
High Data - Log Power

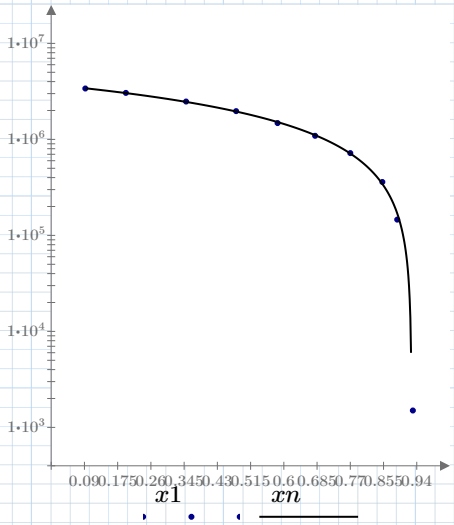
xh	yh
0.93	1500
0.952	$6.6 \cdot 10^0$
0.972	$3.5 \cdot 10^{-2}$
0.980	$3.5 \cdot 10^{-4}$
0.986	10^{-7}

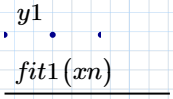
Low Point Fit - 2nd Order Poly

$fit1 := \text{polyfit}(x1, y1, 2)$ $xn := 0.0923, 0.094 .. 0.93$







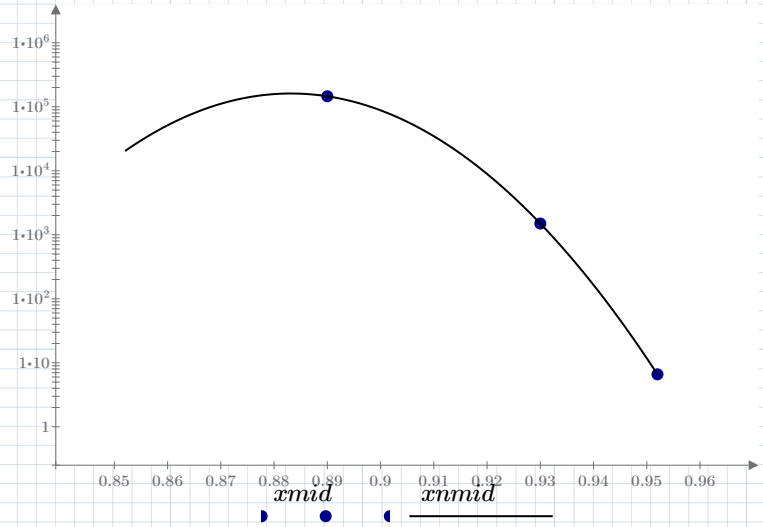


$$\text{polyfitc}(x1, y1, 2) = \begin{bmatrix} \text{“Term”} & \text{“Coefficient”} & \text{“Std Error”} & \text{“95\% CI Low”} & \text{“95\% CI High”} & \text{“VIF”} & \text{“T”} & \text{“P”} \\ \text{“Intercept”} & 3.7271 \cdot 10^6 & 2.9006 \cdot 10^4 & 3.6585 \cdot 10^6 & 3.7957 \cdot 10^6 & NaN & 128.4935 & 2.2804 \cdot 10^{-13} \\ \text{“A”} & -3.3862 \cdot 10^6 & 1.2823 \cdot 10^5 & -3.6894 \cdot 10^6 & -3.083 \cdot 10^6 & 22.2808 & -26.4064 & 1.4298 \cdot 10^{-8} \\ \text{“AA”} & -6.8663 \cdot 10^5 & 1.1941 \cdot 10^5 & -9.6898 \cdot 10^5 & -4.0427 \cdot 10^5 & 22.2808 & -5.7503 & 0.0003 \end{bmatrix}$$

Middle Point Fit - Gaussian Model

$$\begin{bmatrix} a_{mid} \\ b_{mid} \\ c_{mid} \end{bmatrix} := \begin{bmatrix} 1.6131796 \cdot 10^5 \\ 8.831593287 \cdot 10^{-1} \\ 1.53137684 \cdot 10^{-2} \end{bmatrix}$$

$fit2(x) := a_{mid} \cdot e^{\frac{-(x - b_{mid})^2}{2 \cdot c_{mid}^2}}$ $xnmid := .852, 0.853 \ldots 952$



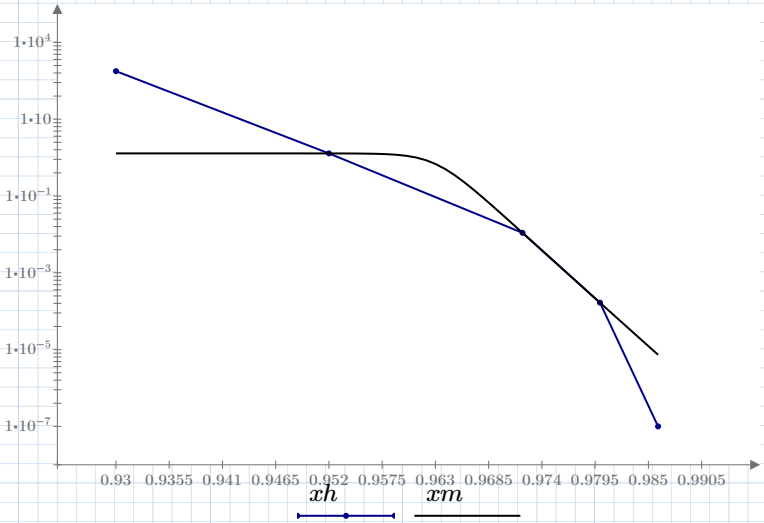
$ymid$

$fit2(xnmid)$

Low Point Fit - Logisitic Power

$a_{low} := 6.6102964$ $b_{low} := 9.6299766 \cdot 10^{-1}$ $c_{low} := 5.626899 \cdot 10^{2}$ $xm := 0.93, 0.931 .. 0.986$

$$fit3(x) := \frac{a_{low}}{1 + \left(\frac{x}{b_{low}}\right)^{c_{low}}}$$



yh

$fit3(xm)$

Butterworth Filters

$Start1 := 0$ $Start2 := 0.89$ $Start3 := 0.979$ $End := 0.986$

half-width	center
$c1 := \frac{Start2 - Start1}{2} = 0.445$	$b1 := \frac{Start1 + Start2}{2} = 0.445$
$c2 := \frac{Start3 - Start2}{2} = 0.0445$	$b2 := \frac{Start2 + Start3}{2} = 0.9345$
$c3 := \frac{End - Start3}{2} = 0.0035$	$b3 := \frac{Start3 + End}{2} = 0.9825$

$n1 := 200$ $n2 := \text{round}\left(\frac{n1}{(c1)}, 0\right) = 20$ $n3 := \text{round}\left(\frac{n2}{(c3)}, 0\right) = 254$

ratio n's by half-width

Keep n even or else you divide by zero

$n2 := 20$

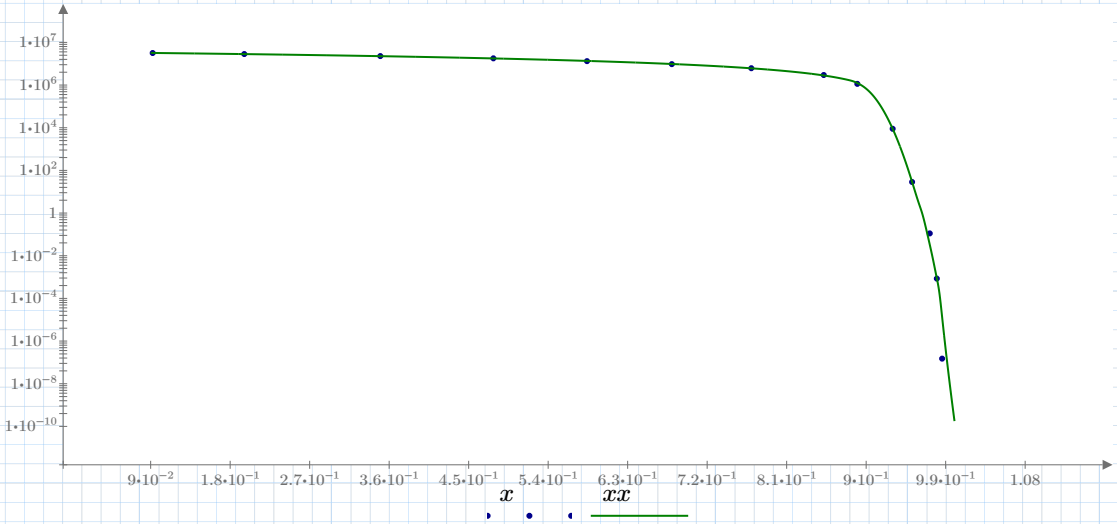
$n3 := 2$

$$f1(x) := \frac{1}{1+\left(\frac{x-b1}{c1}\right)^{n1}} \qquad f2(x) := \frac{1}{1+\left(\frac{x-b2}{c2}\right)^{n2}} \qquad f3(x) := \frac{1}{1+\left(\frac{x-b3}{c3}\right)^{n3}}$$

$$Fit4(x) := f1(x)\cdot fit1(x) + f2(x)\cdot fit2(x) + f3(x)\cdot fit3(x)$$

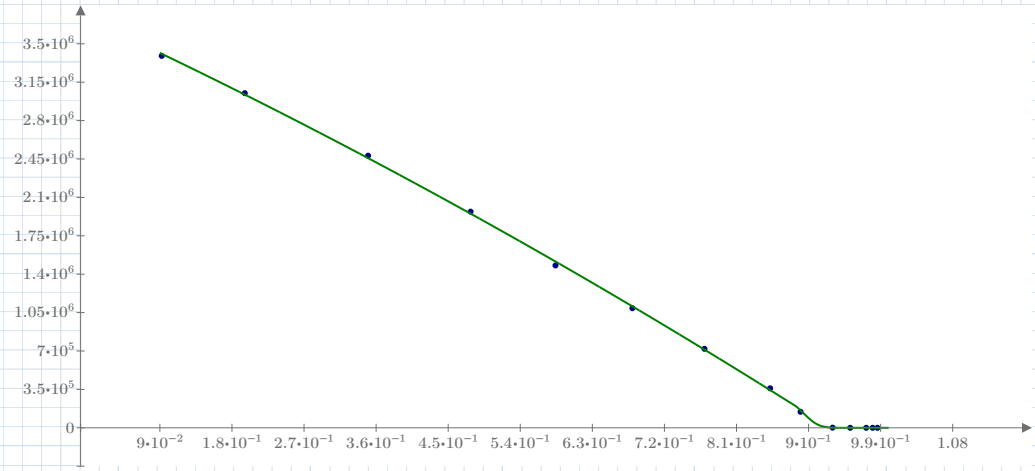
$$Fit_{fin}(x) := \frac{1}{1+\left(\frac{x-b1}{c1}\right)^{n1}}\cdot\left(-6.8663\cdot 10^{5}\cdot x^{2} + -3.3862\cdot 10^{6}\cdot x + 3.7271\cdot 10^{6}\right) + \frac{1}{1+\left(\frac{x-b2}{c2}\right)^{n2}}\cdot\left(a_{mid}\cdot e^{\frac{-(x-b_{mid})^{2}}{2\cdot c_{mid}^{2}}}\right) + \frac{1}{1+\left(\frac{x-b3}{c3}\right)^{n3}}\cdot\left(\frac{a_{low}}{1+\left(\frac{x}{b_{low}}\right)^{c_{low}}}\right)$$

$xx := 0.09, 0.0901 .. 1$



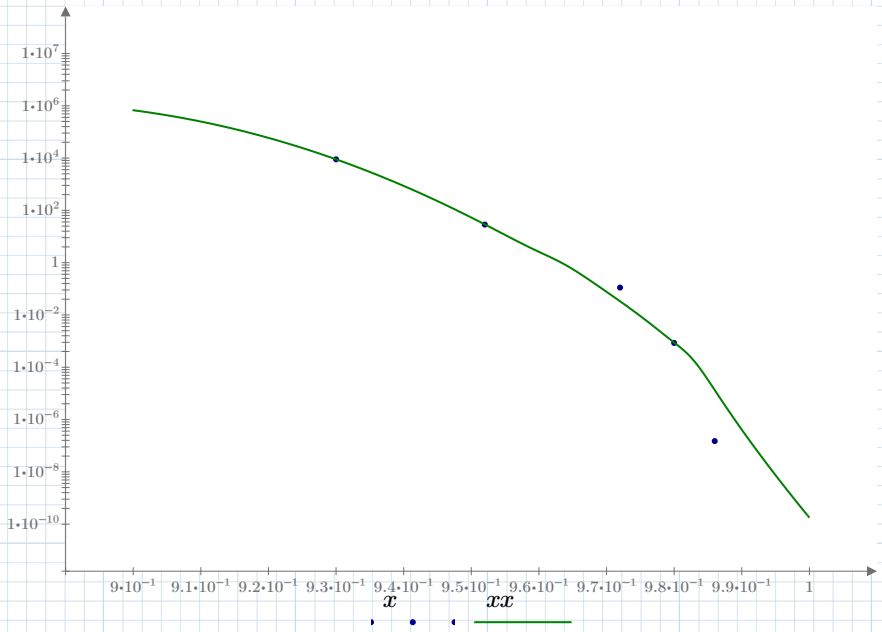
y

$Fit_{fin}(xx)$



y

$Fit_{fin}(xx)$


$1 \cdot 10^{7}$
$1 \cdot 10^{6}$
$1 \cdot 10^{4}$
$1 \cdot 10^{2}$
1
$1 \cdot 10^{-2}$
$1 \cdot 10^{-4}$
$1 \cdot 10^{-6}$
$1 \cdot 10^{-8}$
$1 \cdot 10^{-10}$
$9 \cdot 10^{-1}$ $9.1 \cdot 10^{-1}$ $9.2 \cdot 10^{-1}$ $9.3 \cdot 10^{-1}$ $9.4 \cdot 10^{-1}$ $9.5 \cdot 10^{-1}$ $9.6 \cdot 10^{-1}$ $9.7 \cdot 10^{-1}$ $9.8 \cdot 10^{-1}$ $9.9 \cdot 10^{-1}$ 1
x
xx
y
$Fit_{fin}(xx)$

09/19/2019