```
(*******************************************************************************************)
(*  This Mathematica notebook contains code written for fitting qPCR data with MAK2, the mechanistic 2   *)
(*  parameter model derived from the mass action kinetics of PCR and trials of fitting qPCR data with    *)
(*  MAK2 curves.                                                                                         *)
(*                                                                                                       *)
(*  The 'd0' values resulting from the trials are used to develop the plots in figure 3 of the MAK2 paper.  *)
(*                                                                                                       *)
(******  Written by Gregory Boggy (November 2009) , based on optimization code written Avi Mayo *****)
(*******************************************************************************************)
```

dataCTfunc is a function to define the data to be fitted. The variable 'data' is the name of the variable to be evaluated. The variable 'frac' defines the fraction of the maximum signal the threshold for excluding data is set. Determination of the data to fit is described in Materials and Methods of the MAK2 article.

```
dataCTfunc[data_] :=
  {
    b = Abs[data[[1, 2]]] + 0.0001;
    datadiff = {};
    For[i = 1, i < Length[data], i++;
     diff = data[[i, 2]] - data[[i - 1, 2]]; datadiff = Append[datadiff, diff]];
    datadiffdiff = {};
    avdiffdiff = {};
    For[i = 1, i < Length[data] - 1, i++; diffdiff = datadiff[[i]] - datadiff[[i - 1]];
     datadiffdiff = Append[datadiffdiff, diffdiff]];
    For[i = 1, i < Length[data] - 2, i++; av = datadiffdiff[[i]] + datadiffdiff[[i - 1]];
     avdiffdiff = Append[avdiffdiff, av]];
    pos = Position[avdiffdiff, Max[avdiffdiff]][[1]][[1]];
    CT = Position[datadiffdiff, Max[datadiffdiff[[pos ;; pos + 1]]]][[1]][[1]] + 2;
    data[[1 ;; CT]]}[[1]];
```

Now, we define a cost function. It is set as the residual sum of squares. The variable 'yList' is the list of DNA values and the variable 'intensity' is a list of the corresponding fluorescence intensity values. These lists are populated in each iteration of optimization when a simulation with the current parameter values is performed. The for loop performs this operation. The variable q is the current dsDNA value and d is the value for the previous cycle. The data used to evaluate the cost function is determined by 'dataCTfunc' above.

```
c[x : {_?NumberQ ..}] := TimeConstrained[Module[{}, {
       yList = {d0} /. Thread[par -> x];
       intensity = {};
       q = d + k * Log[1 + d / k] /. Thread[par → x];
       For[count = 1, count < Length[dataCT] + 1, count++, y1 = q /. d → yList[[count]];
        yList = Append[yList, y1];
        intensity = Append[intensity, (y1 + base) /. Thread[par -> x]]];
       Total[((#[[2]] - intensity[[#[[1]]]])^2 & /@ dataCT)]}][[1]], 2];
```

Here, we define the optimization method. It is set to Nelder-Mead. Initialize number of loops with 'NumberOfLoops'. If the optimization algorithm gets stuck in a local minimum, a new loop will begin and start optimizing from a new point. Set 'PertuAmp', the variable that affects the window size for an initial parameter value for a new loop.

```
method =
  {{"DifferentialEvolution", "SearchPoints" → 400, "RandomSeed" → RandomInteger[{1, 100}]},
   {"SimulatedAnnealing", "PerturbationScale" → 3, "BoltzmannExponent" →
     Function[{i, df, f0}, -df/e^(i/10)], "RandomSeed" → RandomInteger[{1, 100}]},
   {"NelderMead", "ShrinkRatio" → 0.95`, "ContractRatio" → 0.95`,
    "ReflectRatio" → 1.5`, "RandomSeed" → RandomInteger[{1, 100}]},
   {Automatic, "RandomSeed" → RandomInteger[{1, 100}]}};
MethodType = 3;
NumberOfLoops = 0;
PertuAmp = 0.9;(*you can fix amplitude of perturbation
 or make it a decreasing function of the loop number 1/10^NumberOfLoops *)
```

MAK2 is the main function. The variables 'data' and 'frac' are passed to 'dataCTfunc' and 'dirname' is the name of the directory that data is written to--a new foler is made for each experimental well.

The three parameters and corresponding constraints must be defined. An initial parameter set is also defined with "current_fit". Maximum number of optimization iterations are set with 'MaxIter'. No new loops (see below) will be started after this value has been reached.

If the current cost function value is lower than any previous value, then the display is updated.

```
MAK2[data_] :=
  {SelectionMove[nb, All, GeneratedCell];
   coutlow = 1;
   dataCT = dataCTfunc[data];

   par = {d0, k, base}; dhigh = .01; dlow = 10^(-12);
   constraints = Join[{d0 < dhigh, d0 > dlow,
      k < Max[data[[All, 2]]], k > 0.001, base > -Abs[1.1 * b], base < Abs[1.1 * b]}];
   {d0 → dlow * 100, k → 1.0, base → b}[[All, 2]] >> "current_fit";
   MaxIter = 5000;

   ShowStatus[status_] := LinkWrite[$ParentLink,
     SetNotebookStatusLine[FrontEnd`EvaluationNotebook[], ToString[status]]];
   nb = EvaluationNotebook[];
   spar = ToString /@ par;

   i = 0;
   NumberOfLoops = 0;
   While[i < MaxIter, NumberOfLoops++;

    curr = ReadList["current_fit"][[1]];
    v = Flatten[#, 1] & /@ Transpose[{par, N[{1 - PertuAmp, 1 + PertuAmp} (#)] & /@ Abs[curr]}];
    rt = SessionTime[];
    NMinimize[{c[par], constraints}, v, Method → method[[3]],
     MaxIterations → 1000, StepMonitor :> (par >> "current_fit";
       cout = N[Round[c[par] * 10^8] / (10^8)];
       If[cout ≤ coutlow * 0.99999,
        lowoutRoutine = {Module[{st = "c=" <> ToString[N[(c[par])]] <> "    " <> "i=" <>
              ToString[i] <> "    " <> "t=" <> ToString[Round[SessionTime[] - rt]] <>
              "     " <> "loops=" <> ToString[NumberOfLoops]},
            ShowStatus[st]; NotebookDelete[nb];

            Print[Show[{ListPlot[data, PlotLabel -> st,
                 PlotRange → All], ListLinePlot[intensity, PlotRange → All]}]];
            rt = SessionTime[];]; Print[Thread[spar → par]]; SelectionMove[
            nb, All, GeneratedCell]; coutlow = cout};];
       i++)]];
  };
```

Now, we set the filepath and import data from a .csv file. First column of the file should be cycles. The column data are named. Data are transposed with the cycle numbers so that the data for an experimental well is a 2 x n array with column numbers and corresponding fluorescence.

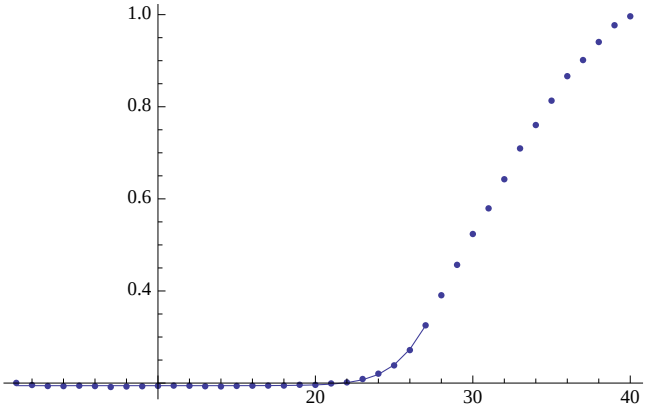
The following data in 'growth.csv' was generated by the authors.

```
filepath = "Desktop/data/";
SetDirectory[filepath];
indata = Import["growth.csv"];
cycle = indata[[All, 1]];

D3data = Transpose[{cycle, indata[[All, 2]]}][[2 ;; 41]];
D4data = Transpose[{cycle, indata[[All, 3]]}][[2 ;; 41]];
D5data = Transpose[{cycle, indata[[All, 4]]}][[2 ;; 41]];
D6data = Transpose[{cycle, indata[[All, 5]]}][[2 ;; 41]];
D7data = Transpose[{cycle, indata[[All, 6]]}][[2 ;; 41]];
D8data = Transpose[{cycle, indata[[All, 7]]}][[2 ;; 41]];
E3data = Transpose[{cycle, indata[[All, 8]]}][[2 ;; 41]];
E4data = Transpose[{cycle, indata[[All, 9]]}][[2 ;; 41]];
E5data = Transpose[{cycle, indata[[All, 10]]}][[2 ;; 41]];
E6data = Transpose[{cycle, indata[[All, 11]]}][[2 ;; 41]];
E7data = Transpose[{cycle, indata[[All, 12]]}][[2 ;; 41]];
E8data = Transpose[{cycle, indata[[All, 13]]}][[2 ;; 41]];
```

What follows are actual trials that can be reevaluated.

```
MAK2[D3data]
```

c=0.0000729625 i=3627 t=0 loops=4

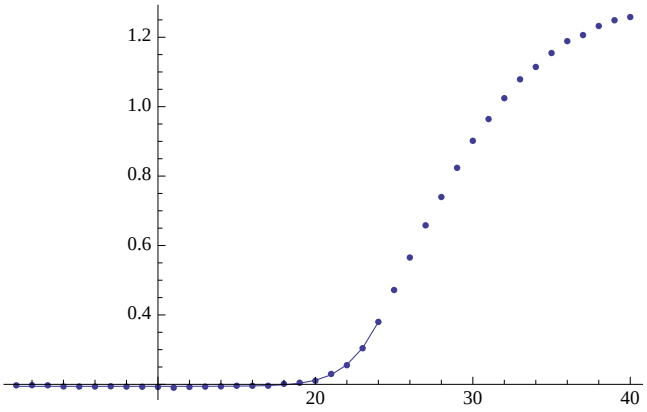


$\{d0 \to 1.59848 \times 10^{-9},\ k \to 0.0635667,\ base \to 0.194352\}$

{Null}

```
MAK2[D4data]
```

c=0.0000746762 i=4372 t=4 loops=5

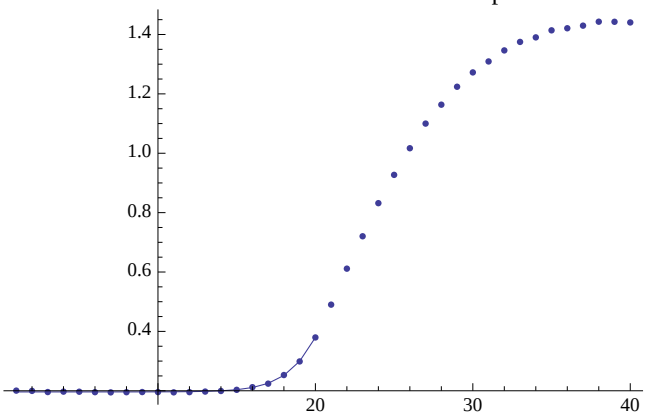


$\{d0 \to 1.71786 \times 10^{-8}, k \to 0.102162, base \to 0.194352\}$

{Null}

MAK2[D5data]

c=0.0000498731 i=1667 t=1 loops=2

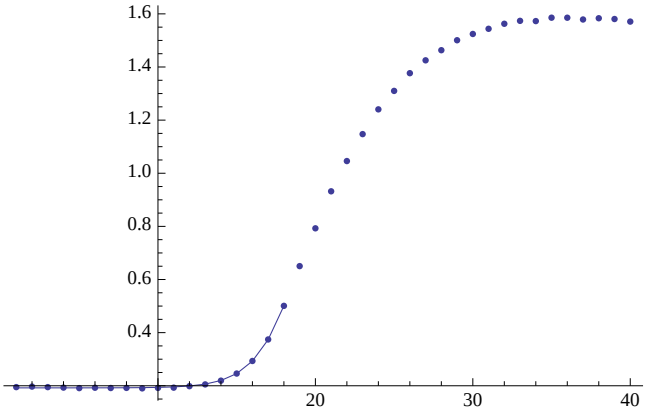


$\{d0 \to 2.30757 \times 10^{-7}, k \to 0.162611, base \to 0.196127\}$

{Null}

MAK2[D6data]

c=0.0000641951 i=4735 t=12 loops=5

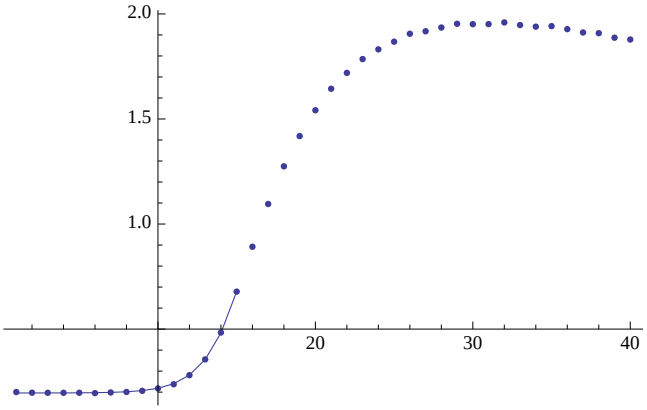


$\{d0 \to 1.75799 \times 10^{-6},\ k \to 0.188528,\ base \to 0.192083\}$

{Null}

MAK2[D7data]

c=0.0000395248 i=750 t=0 loops=1

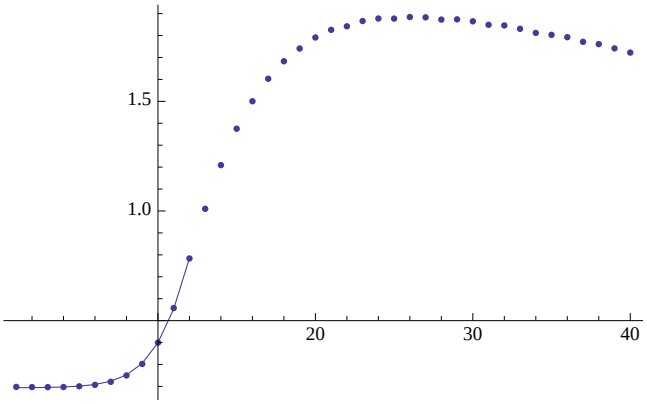


$\{d0 \to 0.0000224502,\ k \to 0.279824,\ base \to 0.195958\}$

{Null}

MAK2[D8data]

c=0.0000618078 i=2608 t=10 loops=2

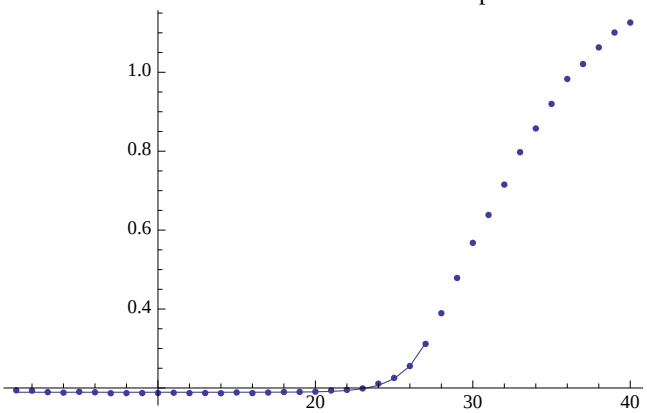


{d0 → 0.000241108, k → 0.279332, base → 0.19366}

{Null}

MAK2[E3data]

c=0.000118114 i=458 t=0 loops=1

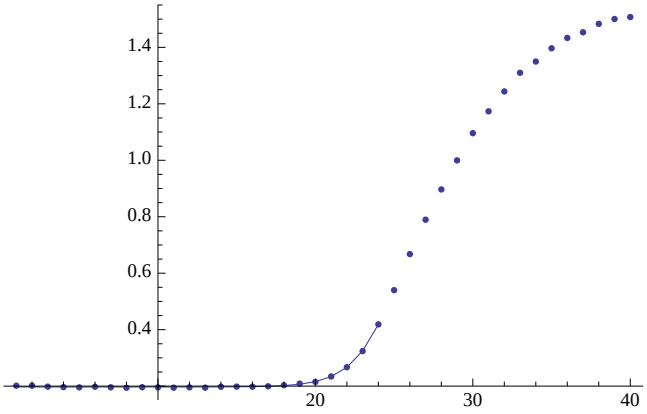


{d0 → 1.05864 × 10^-9, k → 0.233823, base → 0.189163}

{Null}

MAK2[E4data]

c=0.0000808018 i=5419 t=14 loops=6

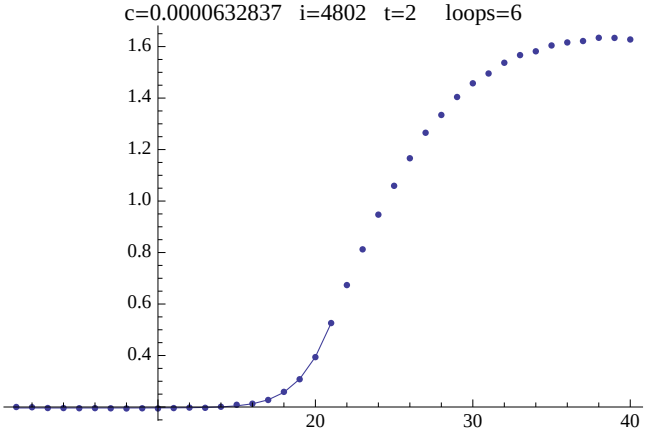


$\{d0 \to 1.85471 \times 10^{-8}, k \to 0.159537, base \to 0.196981\}$

{Null}

MAK2[E5data]

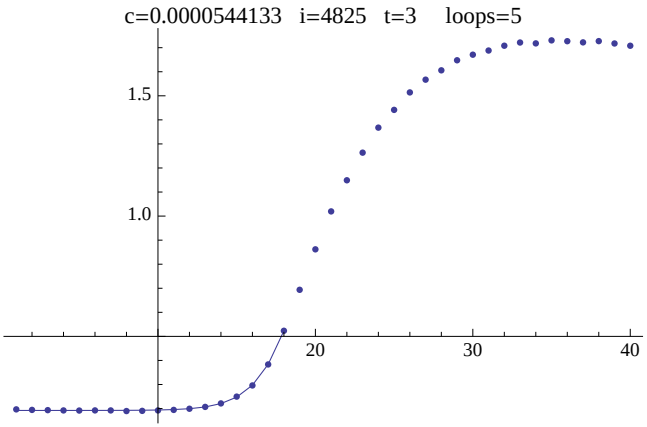
c=0.0000632837 i=4802 t=2 loops=6



$\{d0 \to 2.52569 \times 10^{-7}, k \to 0.16845, base \to 0.196262\}$

{Null}

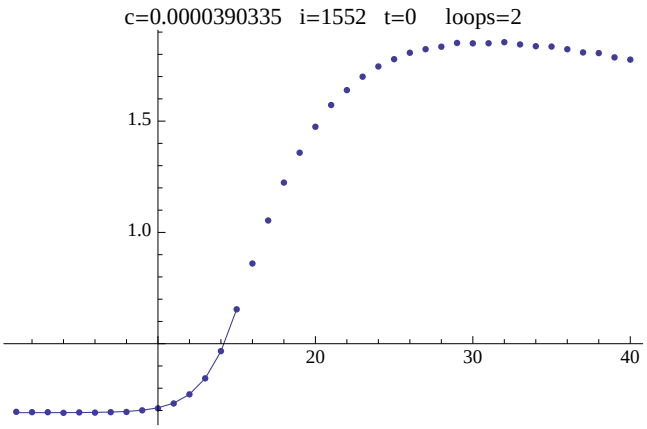
MAK2[E6data]



$$\{d0 \to 1.79533 \times 10^{-6},\ k \to 0.230369,\ base \to 0.192131\}$$

{Null}

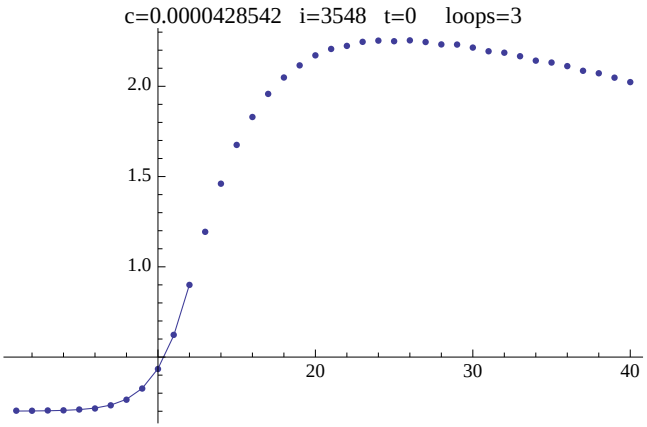
MAK2[E7data]



$$\{d0 \to 0.0000217174,\ k \to 0.265815,\ base \to 0.190084\}$$

{Null}

MAK2[E8data]




```
{d0 → 0.000267742, k → 0.380452, base → 0.200492}
```

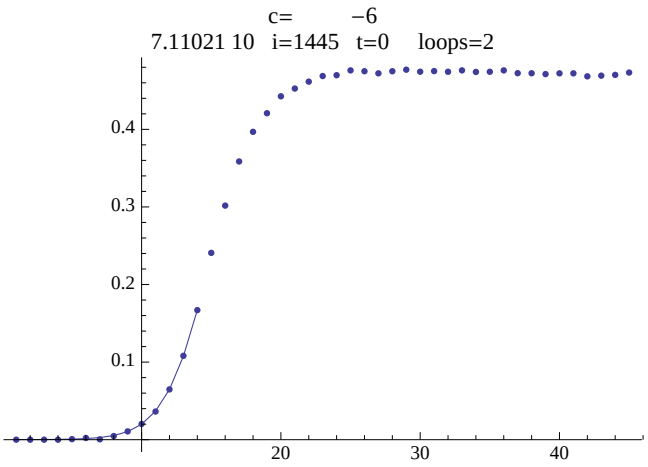
```
{Null}
```

The following are data and trials from the 'rutledge.csv' dataset.

```
indata = Import["rutledge.csv"];
cycle = indata[[All, 1]][[2 ;;]];

X111data = Transpose[{cycle, indata[[All, 3]][[2 ;;]]}];
X112data = Transpose[{cycle, indata[[All, 4]][[2 ;;]]}];
X113data = Transpose[{cycle, indata[[All, 5]][[2 ;;]]}];
X114data = Transpose[{cycle, indata[[All, 6]][[2 ;;]]}];
X121data = Transpose[{cycle, indata[[All, 7]][[2 ;;]]}];
X122data = Transpose[{cycle, indata[[All, 8]][[2 ;;]]}];
X123data = Transpose[{cycle, indata[[All, 9]][[2 ;;]]}];
X124data = Transpose[{cycle, indata[[All, 10]][[2 ;;]]}];
X131data = Transpose[{cycle, indata[[All, 11]][[2 ;;]]}];
X132data = Transpose[{cycle, indata[[All, 12]][[2 ;;]]}];
X133data = Transpose[{cycle, indata[[All, 13]][[2 ;;]]}];
X134data = Transpose[{cycle, indata[[All, 14]][[2 ;;]]}];
X141data = Transpose[{cycle, indata[[All, 15]][[2 ;;]]}];
X142data = Transpose[{cycle, indata[[All, 16]][[2 ;;]]}];
X143data = Transpose[{cycle, indata[[All, 17]][[2 ;;]]}];
X144data = Transpose[{cycle, indata[[All, 18]][[2 ;;]]}];
X151data = Transpose[{cycle, indata[[All, 19]][[2 ;;]]}];
X152data = Transpose[{cycle, indata[[All, 20]][[2 ;;]]}];
X153data = Transpose[{cycle, indata[[All, 21]][[2 ;;]]}];
X154data = Transpose[{cycle, indata[[All, 22]][[2 ;;]]}];
X211data = Transpose[{cycle, indata[[All, 23]][[2 ;;]]}];
X212data = Transpose[{cycle, indata[[All, 24]][[2 ;;]]}];
X213data = Transpose[{cycle, indata[[All, 25]][[2 ;;]]}];
X214data = Transpose[{cycle, indata[[All, 26]][[2 ;;]]}];
X221data = Transpose[{cycle, indata[[All, 27]][[2 ;;]]}];
X222data = Transpose[{cycle, indata[[All, 28]][[2 ;;]]}];
```

```
X223data = Transpose[{cycle, indata[[All, 29]][[2 ;;]]}];
X224data = Transpose[{cycle, indata[[All, 30]][[2 ;;]]}];
X231data = Transpose[{cycle, indata[[All, 31]][[2 ;;]]}];
X232data = Transpose[{cycle, indata[[All, 32]][[2 ;;]]}];
X233data = Transpose[{cycle, indata[[All, 33]][[2 ;;]]}];
X234data = Transpose[{cycle, indata[[All, 34]][[2 ;;]]}];
X241data = Transpose[{cycle, indata[[All, 35]][[2 ;;]]}];
X242data = Transpose[{cycle, indata[[All, 36]][[2 ;;]]}];
X243data = Transpose[{cycle, indata[[All, 37]][[2 ;;]]}];
X244data = Transpose[{cycle, indata[[All, 38]][[2 ;;]]}];
X251data = Transpose[{cycle, indata[[All, 39]][[2 ;;]]}];
X252data = Transpose[{cycle, indata[[All, 40]][[2 ;;]]}];
X253data = Transpose[{cycle, indata[[All, 41]][[2 ;;]]}];
X254data = Transpose[{cycle, indata[[All, 42]][[2 ;;]]}];
X311data = Transpose[{cycle, indata[[All, 43]][[2 ;;]]}];
X312data = Transpose[{cycle, indata[[All, 44]][[2 ;;]]}];
X313data = Transpose[{cycle, indata[[All, 45]][[2 ;;]]}];
X314data = Transpose[{cycle, indata[[All, 46]][[2 ;;]]}];
X321data = Transpose[{cycle, indata[[All, 47]][[2 ;;]]}];
X322data = Transpose[{cycle, indata[[All, 48]][[2 ;;]]}];
X323data = Transpose[{cycle, indata[[All, 49]][[2 ;;]]}];
X324data = Transpose[{cycle, indata[[All, 50]][[2 ;;]]}];
X331data = Transpose[{cycle, indata[[All, 51]][[2 ;;]]}];
X332data = Transpose[{cycle, indata[[All, 52]][[2 ;;]]}];
X333data = Transpose[{cycle, indata[[All, 53]][[2 ;;]]}];
X334data = Transpose[{cycle, indata[[All, 54]][[2 ;;]]}];
X341data = Transpose[{cycle, indata[[All, 55]][[2 ;;]]}];
X342data = Transpose[{cycle, indata[[All, 56]][[2 ;;]]}];
X343data = Transpose[{cycle, indata[[All, 57]][[2 ;;]]}];
X344data = Transpose[{cycle, indata[[All, 58]][[2 ;;]]}];
X351data = Transpose[{cycle, indata[[All, 59]][[2 ;;]]}];
X352data = Transpose[{cycle, indata[[All, 60]][[2 ;;]]}];
X353data = Transpose[{cycle, indata[[All, 61]][[2 ;;]]}];
X354data = Transpose[{cycle, indata[[All, 62]][[2 ;;]]}];
X411data = Transpose[{cycle, indata[[All, 63]][[2 ;;]]}];
X412data = Transpose[{cycle, indata[[All, 64]][[2 ;;]]}];
X413data = Transpose[{cycle, indata[[All, 65]][[2 ;;]]}];
X414data = Transpose[{cycle, indata[[All, 66]][[2 ;;]]}];
X421data = Transpose[{cycle, indata[[All, 67]][[2 ;;]]}];
X422data = Transpose[{cycle, indata[[All, 68]][[2 ;;]]}];
X423data = Transpose[{cycle, indata[[All, 69]][[2 ;;]]}];
X424data = Transpose[{cycle, indata[[All, 70]][[2 ;;]]}];
X431data = Transpose[{cycle, indata[[All, 71]][[2 ;;]]}];
X432data = Transpose[{cycle, indata[[All, 72]][[2 ;;]]}];
X433data = Transpose[{cycle, indata[[All, 73]][[2 ;;]]}];
X434data = Transpose[{cycle, indata[[All, 74]][[2 ;;]]}];
X441data = Transpose[{cycle, indata[[All, 75]][[2 ;;]]}];
X442data = Transpose[{cycle, indata[[All, 76]][[2 ;;]]}];
X443data = Transpose[{cycle, indata[[All, 77]][[2 ;;]]}];
X444data = Transpose[{cycle, indata[[All, 78]][[2 ;;]]}];
X451data = Transpose[{cycle, indata[[All, 79]][[2 ;;]]}];
```

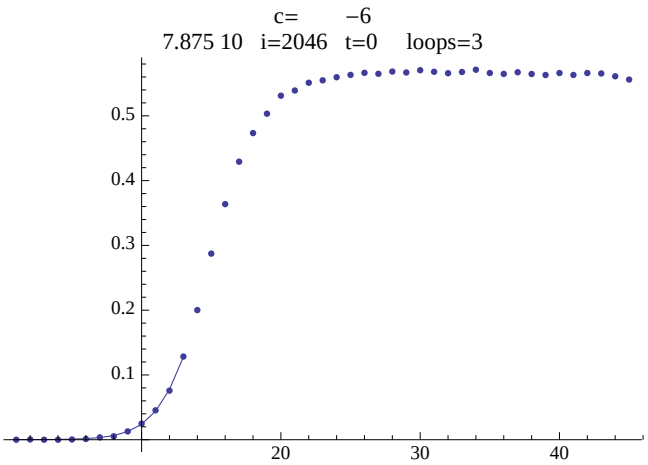
```
X452data = Transpose[{cycle, indata[[All, 80]][[2 ;;]]}];
X453data = Transpose[{cycle, indata[[All, 81]][[2 ;;]]}];
X454data = Transpose[{cycle, indata[[All, 82]][[2 ;;]]}];
X511data = Transpose[{cycle, indata[[All, 83]][[2 ;;]]}];
X512data = Transpose[{cycle, indata[[All, 84]][[2 ;;]]}];
X513data = Transpose[{cycle, indata[[All, 85]][[2 ;;]]}];
X514data = Transpose[{cycle, indata[[All, 86]][[2 ;;]]}];
X521data = Transpose[{cycle, indata[[All, 87]][[2 ;;]]}];
X522data = Transpose[{cycle, indata[[All, 88]][[2 ;;]]}];
X523data = Transpose[{cycle, indata[[All, 89]][[2 ;;]]}];
X524data = Transpose[{cycle, indata[[All, 90]][[2 ;;]]}];
X531data = Transpose[{cycle, indata[[All, 91]][[2 ;;]]}];
X532data = Transpose[{cycle, indata[[All, 92]][[2 ;;]]}];
X533data = Transpose[{cycle, indata[[All, 93]][[2 ;;]]}];
X534data = Transpose[{cycle, indata[[All, 94]][[2 ;;]]}];
X541data = Transpose[{cycle, indata[[All, 95]][[2 ;;]]}];
X542data = Transpose[{cycle, indata[[All, 96]][[2 ;;]]}];
X543data = Transpose[{cycle, indata[[All, 97]][[2 ;;]]}];
X544data = Transpose[{cycle, indata[[All, 98]][[2 ;;]]}];
X551data = Transpose[{cycle, indata[[All, 99]][[2 ;;]]}];
X552data = Transpose[{cycle, indata[[All, 100]][[2 ;;]]}];
X553data = Transpose[{cycle, indata[[All, 101]][[2 ;;]]}];
X554data = Transpose[{cycle, indata[[All, 102]][[2 ;;]]}];
X611data = Transpose[{cycle, indata[[All, 103]][[2 ;;]]}];
X612data = Transpose[{cycle, indata[[All, 104]][[2 ;;]]}];
X613data = Transpose[{cycle, indata[[All, 105]][[2 ;;]]}];
X614data = Transpose[{cycle, indata[[All, 106]][[2 ;;]]}];
X621data = Transpose[{cycle, indata[[All, 107]][[2 ;;]]}];
X622data = Transpose[{cycle, indata[[All, 108]][[2 ;;]]}];
X623data = Transpose[{cycle, indata[[All, 109]][[2 ;;]]}];
X624data = Transpose[{cycle, indata[[All, 110]][[2 ;;]]}];
X631data = Transpose[{cycle, indata[[All, 111]][[2 ;;]]}];
X632data = Transpose[{cycle, indata[[All, 112]][[2 ;;]]}];
X633data = Transpose[{cycle, indata[[All, 113]][[2 ;;]]}];
X634data = Transpose[{cycle, indata[[All, 114]][[2 ;;]]}];
X641data = Transpose[{cycle, indata[[All, 115]][[2 ;;]]}];
X642data = Transpose[{cycle, indata[[All, 116]][[2 ;;]]}];
X643data = Transpose[{cycle, indata[[All, 117]][[2 ;;]]}];
X644data = Transpose[{cycle, indata[[All, 118]][[2 ;;]]}];
X651data = Transpose[{cycle, indata[[All, 119]][[2 ;;]]}];
X652data = Transpose[{cycle, indata[[All, 120]][[2 ;;]]}];
X653data = Transpose[{cycle, indata[[All, 121]][[2 ;;]]}];
X654data = Transpose[{cycle, indata[[All, 122]][[2 ;;]]}];

MAK2[X111data]
```



{d0 → 0.0000211516, k → 0.0547555, base → 0.0000725995}

{Null}

MAK2[X112data]

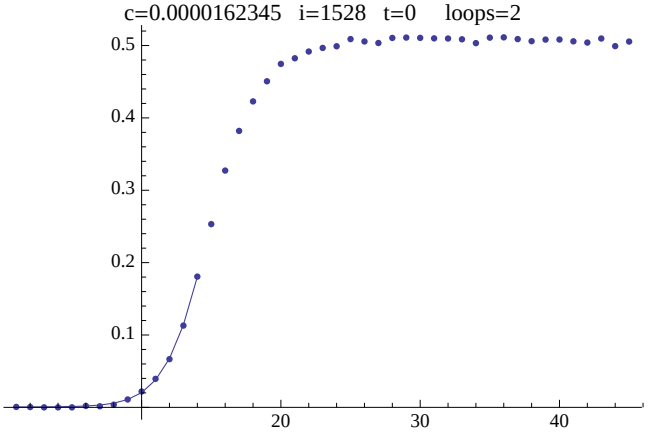


{d0 → 0.0000255827, k → 0.0627979, base → 0.0000744994}

{Null}

MAK2[X113data]

c=0.0000162345 i=1528 t=0 loops=2

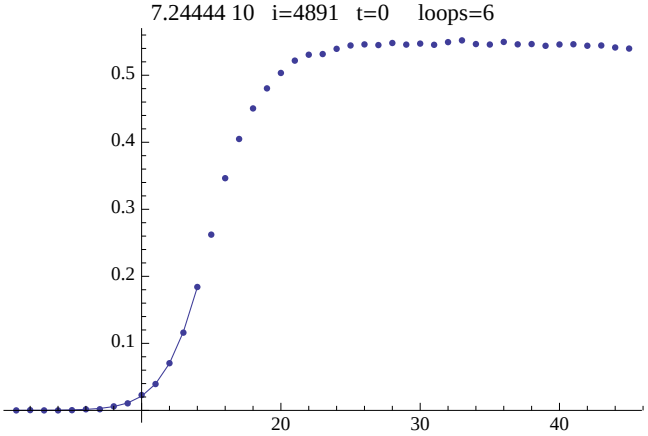


{d0 → 0.0000209167, k → 0.0669527, base → 0.000518441}

{Null}

MAK2[X114data]

c= −6
7.24444 10 i=4891 t=0 loops=6

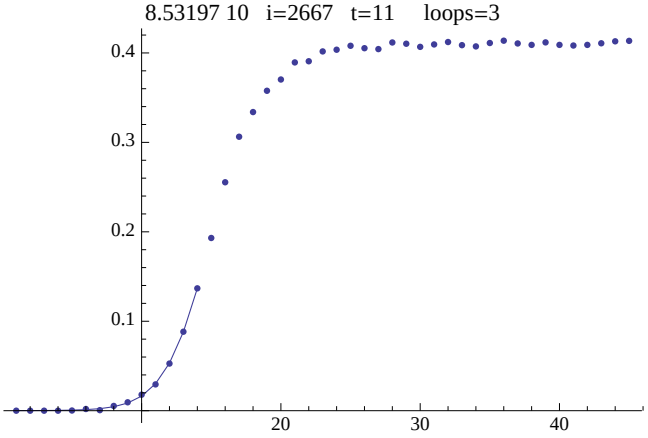


{d0 → 0.0000224298, k → 0.0634366, base → 0.0000705597}

{Null}

MAK2[X121data]

c= −6
8.53197 10 i=2667 t=11 loops=3

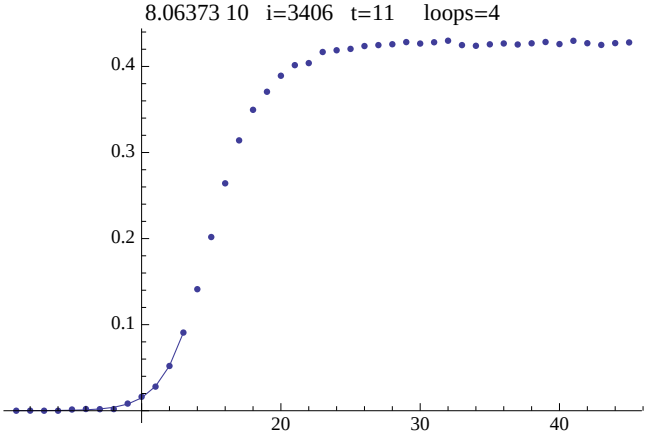


{d0 → 0.0000173814, k → 0.0445128, base → 0.0000790486}

{Null}

MAK2[X122data]

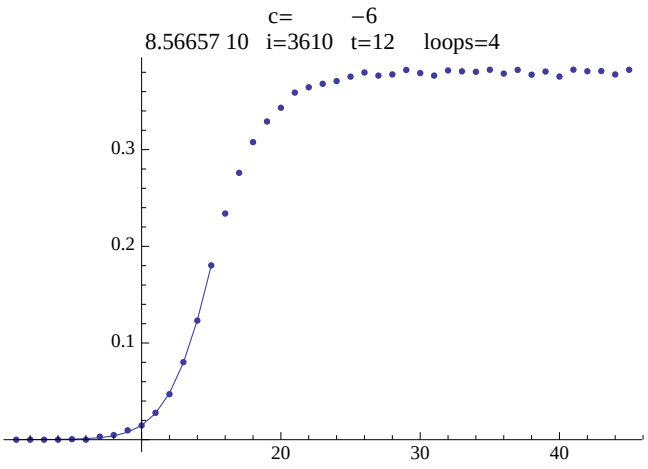
c= −6
8.06373 10 i=3406 t=11 loops=4



{d0 → 0.0000153504, k → 0.0679371, base → 0.0000796993}

{Null}

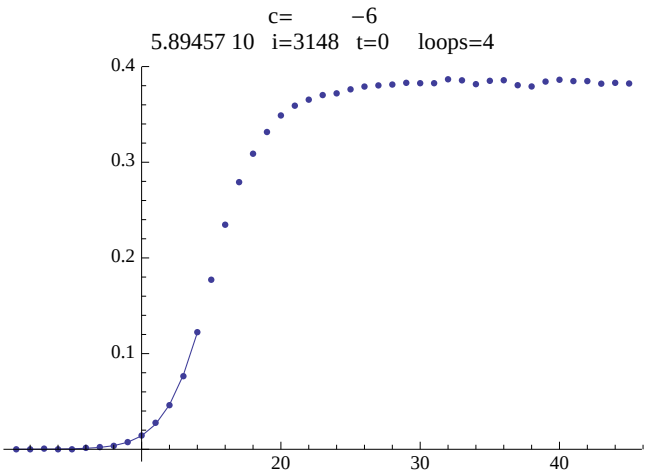
MAK2[X123data]



{d0 → 0.0000157156, k → 0.0402342, base → 0.0000758361}

{Null}

MAK2[X124data]

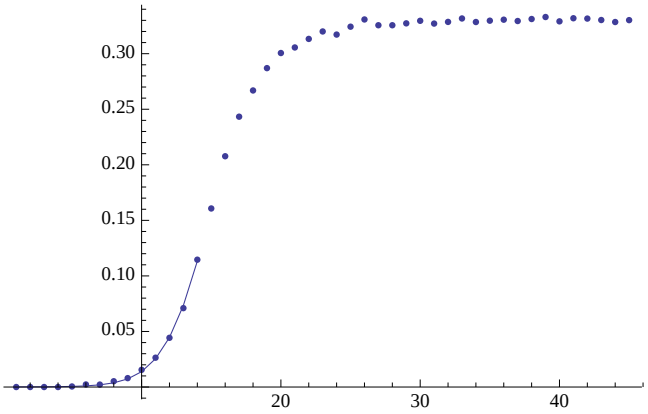


{d0 → 0.0000148131, k → 0.0423767, base → 0.0000800989}

{Null}

MAK2[X131data]

c=0.0000160346 i=5510 t=12 loops=7

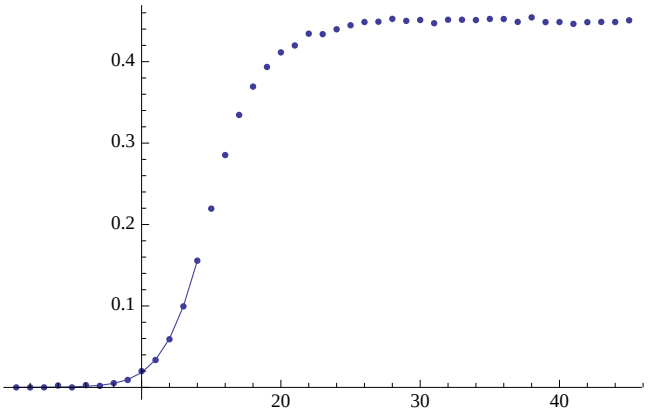



```
{d0 → 0.0000147834, k → 0.0355564, base → 0.0000841035}
```

```
{Null}
```

MAK2[X132data]

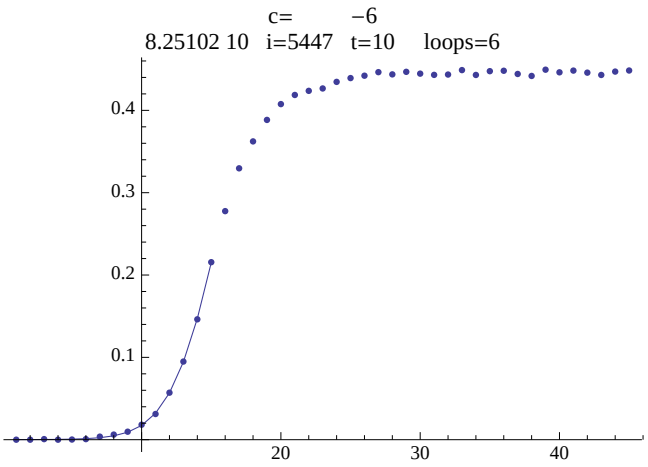
c=0.0000109123 i=5176 t=12 loops=6




```
{d0 → 0.0000193173, k → 0.0522334, base → 0.0000758587}
```

```
{Null}
```

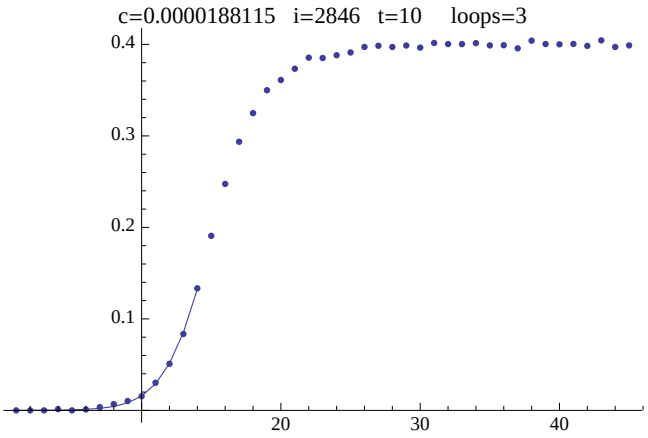
MAK2[X133data]




```
{d0 → 0.0000184043, k → 0.0490376, base → 0.0000813033}
```

```
{Null}
```

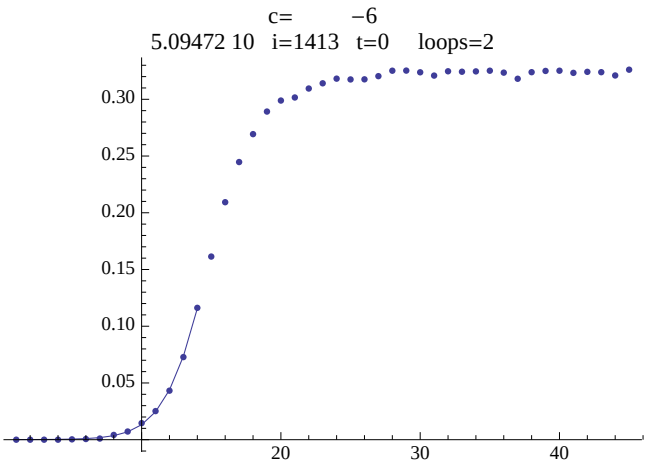
MAK2[X134data]




```
{d0 → 0.0000166774, k → 0.0437521, base → 0.0000802299}
```

```
{Null}
```

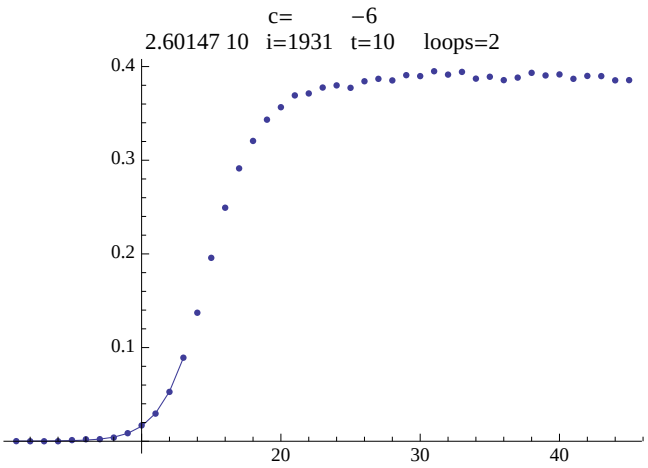
MAK2[X141data]



{d0 → 0.00001388, k → 0.041005, base → 0.0000762559}

{Null}

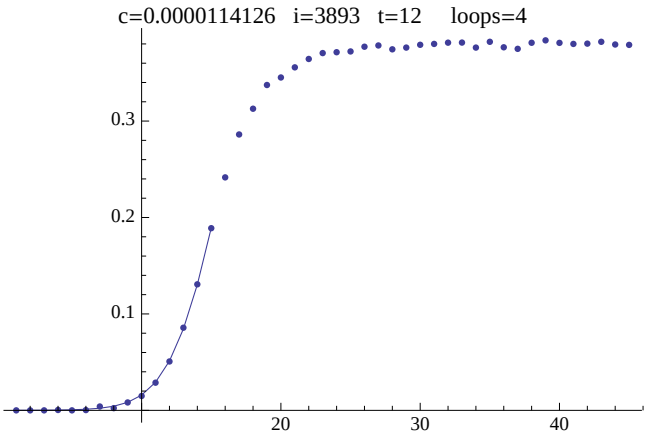
MAK2[X142data]



{d0 → 0.0000167966, k → 0.0494791, base → 0.000154325}

{Null}

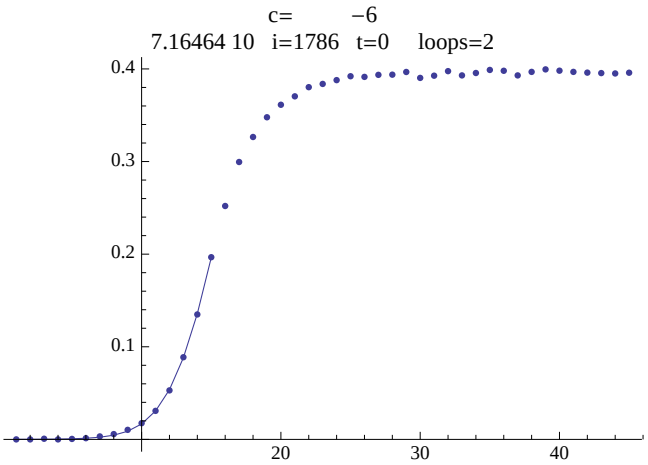
MAK2[X143data]




```
{d0 → 0.0000169211, k → 0.0412664, base → 0.0000701969}
```

```
{Null}
```

MAK2[X144data]

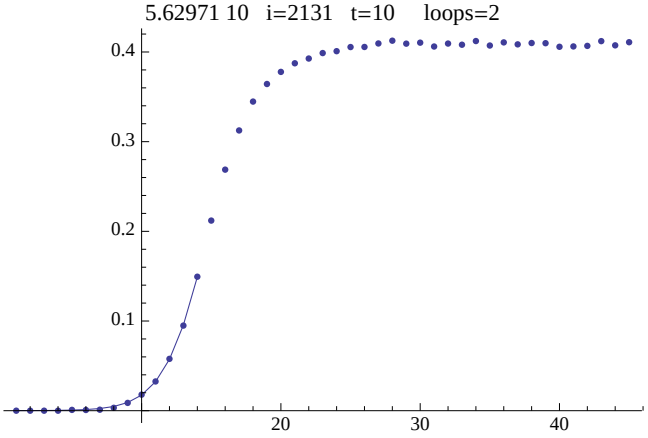



```
{d0 → 0.0000178998, k → 0.041991, base → 0.0000783979}
```

```
{Null}
```

MAK2[X151data]

c= −6
5.62971 10 i=2131 t=10 loops=2

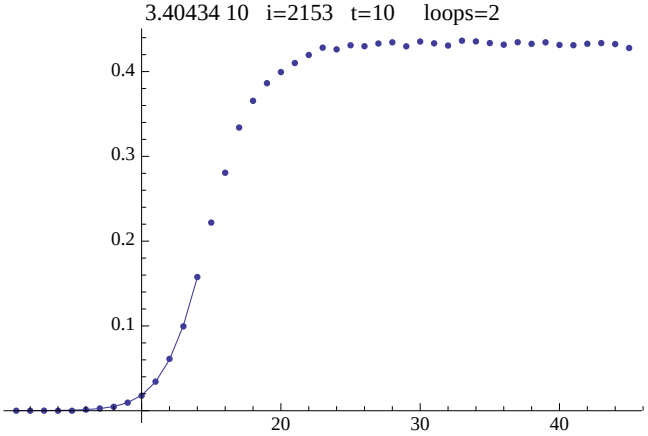


{d0 → 0.0000184738, k → 0.0503875, base → 0.0000735895}

{Null}

MAK2[X152data]

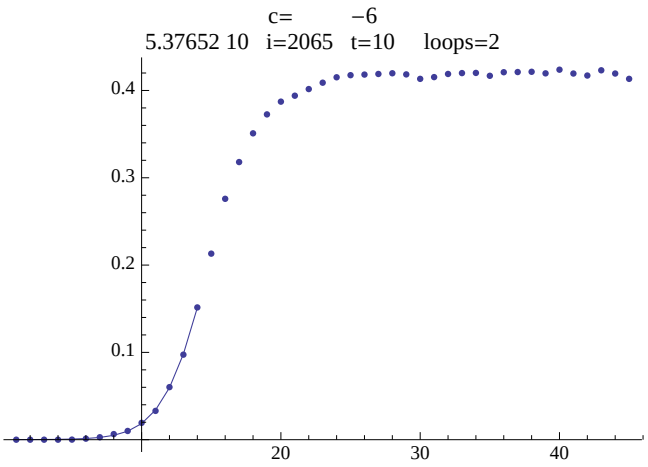
c= −6
3.40434 10 i=2153 t=10 loops=2



{d0 → 0.0000193295, k → 0.0537811, base → 0.0000732598}

{Null}

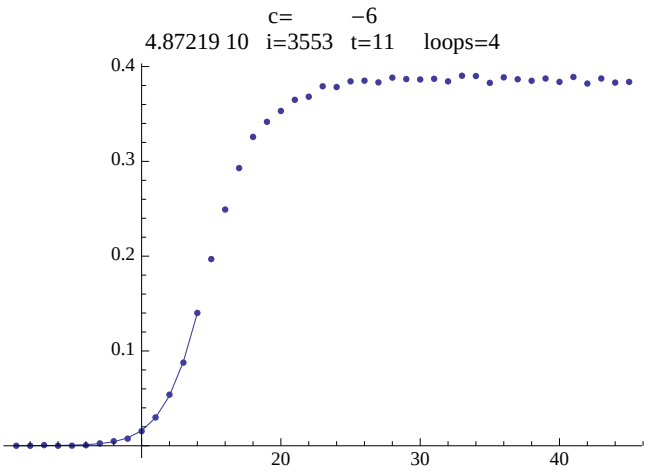
MAK2[X153data]



{d0 → 0.0000197776, k → 0.047303, base → 0.0000736628}

{Null}

MAK2[X154data]

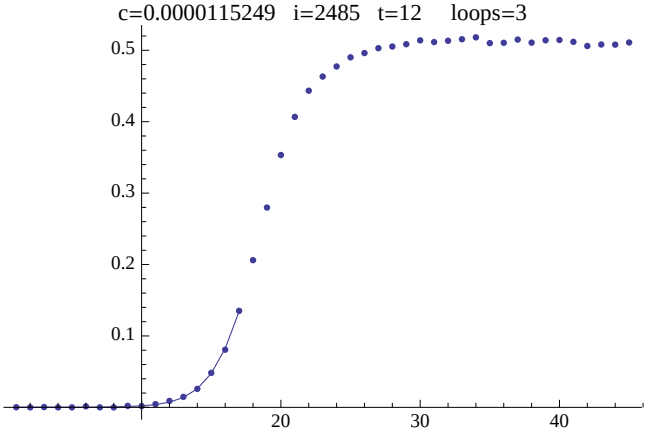


{d0 → 0.0000166967, k → 0.0498706, base → 0.0000797315}

{Null}

MAK2[X211data]

c=0.0000115249 i=2485 t=12 loops=3

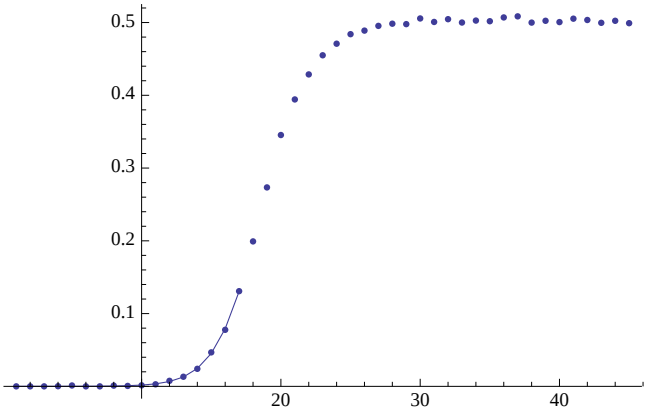


$\{d0 \to 1.74897 \times 10^{-6}, k \to 0.0603787, base \to 0.000301597\}$

{Null}

MAK2[X212data]

c= −6
8.01495 10 i=4700 t=0 loops=6

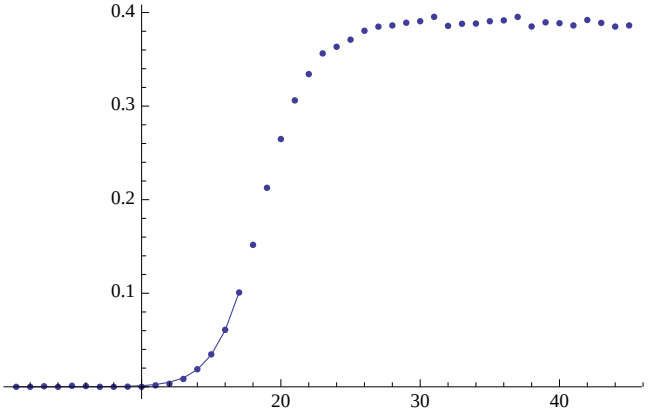


$\{d0 \to 1.64595 \times 10^{-6}, k \to 0.0627888, base \to 0.0000758373\}$

{Null}

MAK2[X213data]

c= −6
9.0686 10 i=3669 t=12 loops=4

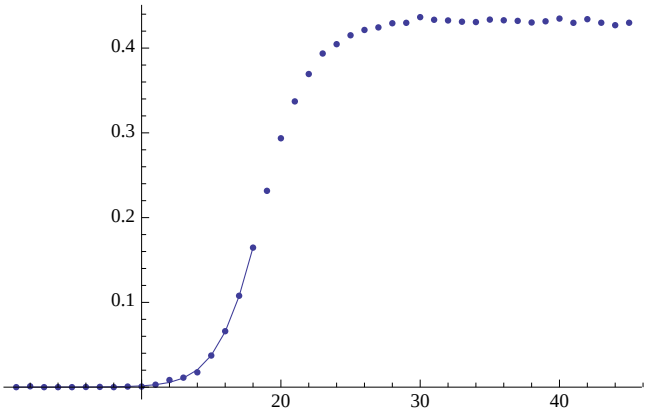


$\{d0 \to 1.22445 \times 10^{-6}, k \to 0.0529717, base \to -0.0000169154\}$

{Null}

MAK2[X214data]

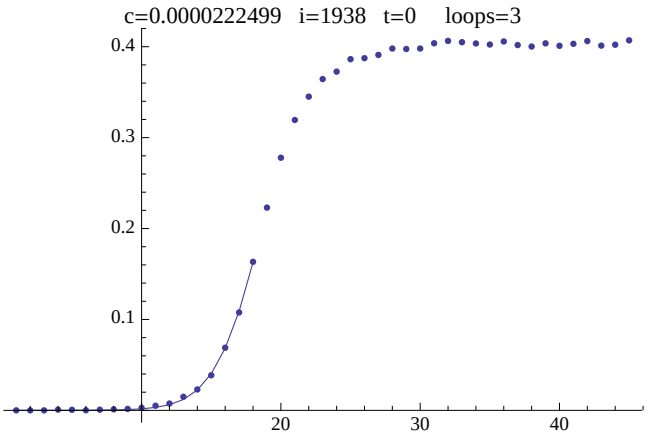
c=0.0000190332 i=3040 t=0 loops=4



$\{d0 \to 1.36899 \times 10^{-6}, k \to 0.0504158, base \to 0.000109602\}$

{Null}

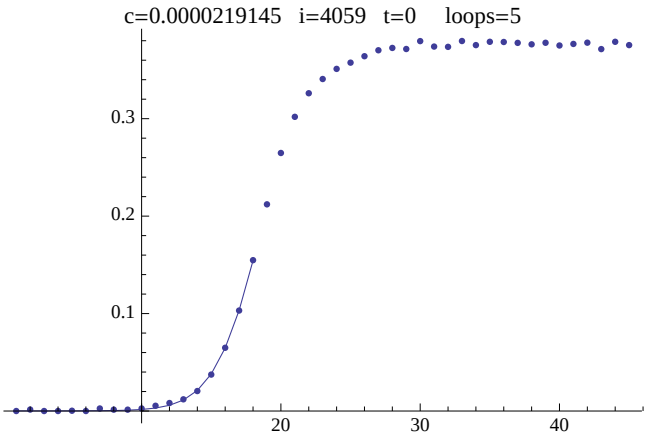
MAK2[X221data]



$\{d0 \to 1.54948 \times 10^{-6}, k \to 0.0421241, base \to 0.00011\}$

{Null}

MAK2[X222data]

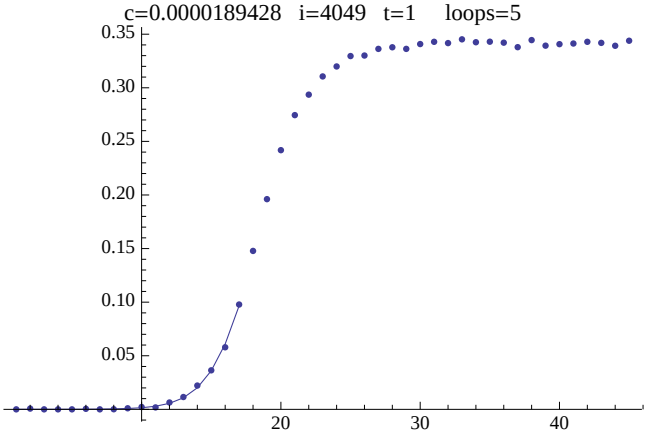


$\{d0 \to 1.45936 \times 10^{-6}, k \to 0.0402708, base \to 0.000109986\}$

{Null}

MAK2[X223data]

c=0.0000189428 i=4049 t=1 loops=5

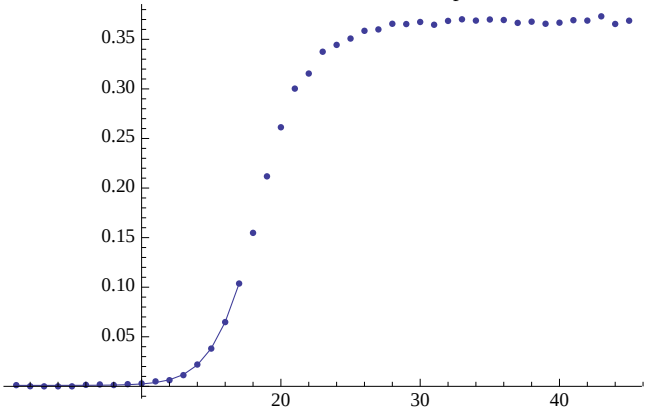


$\{d0 \to 1.40305 \times 10^{-6}, k \to 0.0360402, base \to 0.0000796797\}$

{Null}

MAK2[X224data]

c= −6
7.10903 10 i=5422 t=12 loops=7



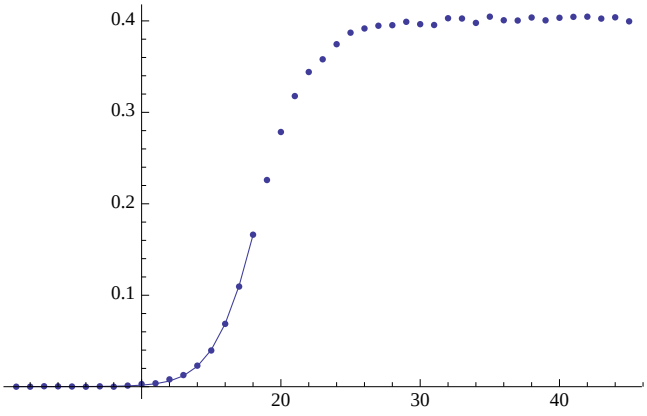
$\{d0 \to 1.42086 \times 10^{-6}, k \to 0.0415489, base \to 0.000947494\}$

{Null}

MAK2[X231data]

c= −6

8.40484 10 i=3072 t=2 loops=4



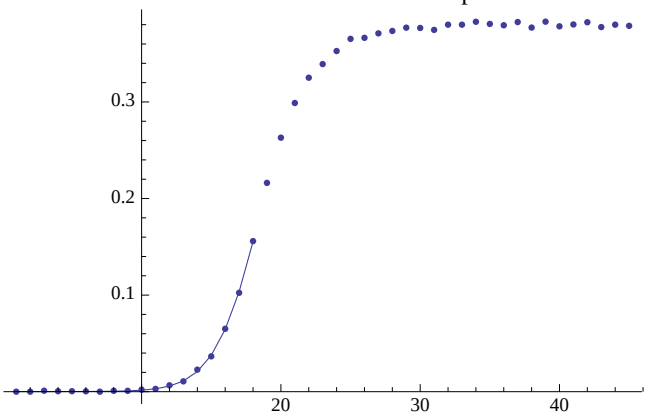
$\{d0 \to 1.53024 \times 10^{-6}, k \to 0.0444653, base \to 0.00011\}$

{Null}

MAK2[X232data]

c= −6

9.13374 10 i=3686 t=1 loops=5

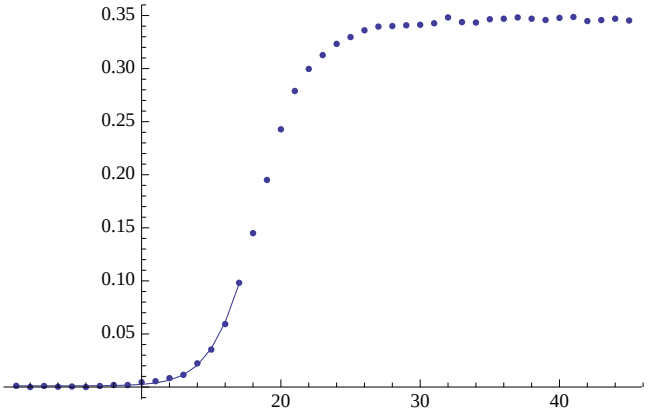


$\{d0 \to 1.4335 \times 10^{-6}, k \to 0.0417002, base \to 0.00011\}$

{Null}

MAK2[X233data]

c=0.0000233717 i=4061 t=14 loops=5

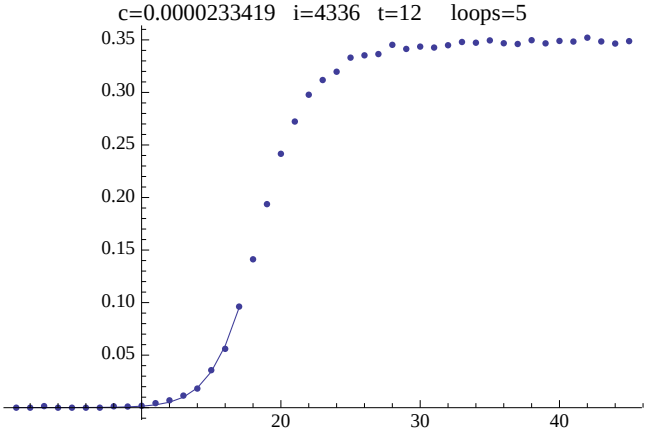


$$\{d0 \to 1.34529 \times 10^{-6},\ k \to 0.0382281,\ base \to 0.0010868\}$$

{Null}

MAK2[X234data]

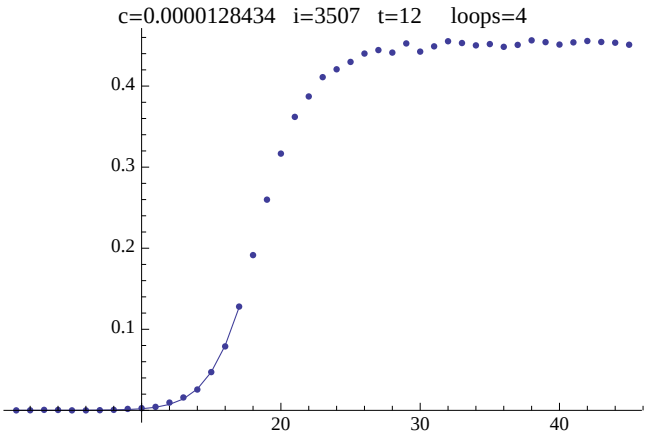
c=0.0000233419 i=4336 t=12 loops=5



$$\{d0 \to 1.28182 \times 10^{-6},\ k \to 0.0402749,\ base \to 0.00011\}$$

{Null}

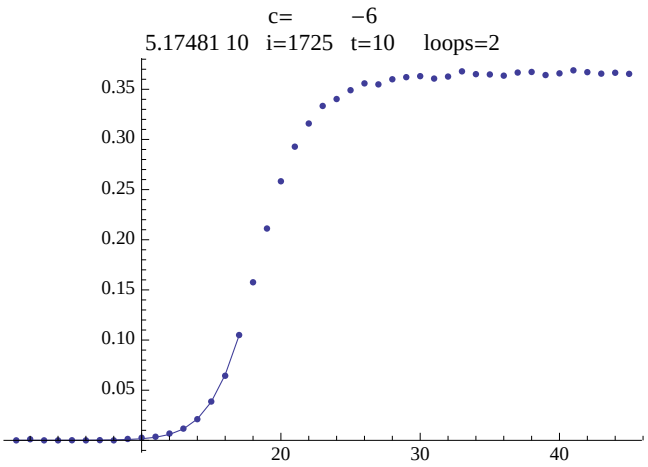
MAK2[X241data]



$\{d0 \to 1.83375 \times 10^{-6}, k \to 0.0478746, base \to 0.00011\}$

{Null}

MAK2[X242data]



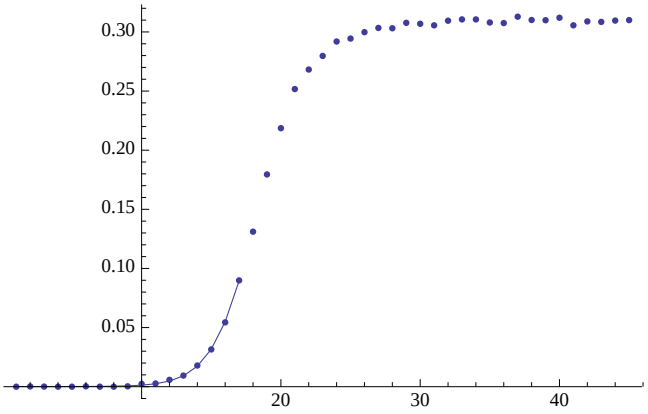
$\{d0 \to 1.4645 \times 10^{-6}, k \to 0.0414065, base \to 0.00011\}$

{Null}

MAK2[X243data]

c= −6

3.68135 10 i=2013 t=10 loops=2



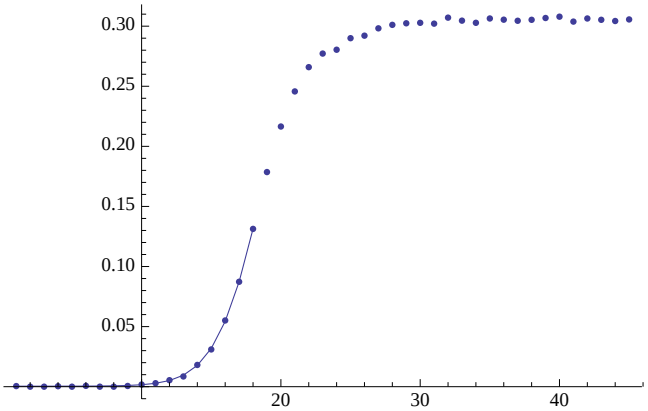
$\{d0 \to 1.17296 \times 10^{-6}, k \to 0.0399297, base \to 0.0000965587\}$

{Null}

MAK2[X244data]

c= −6

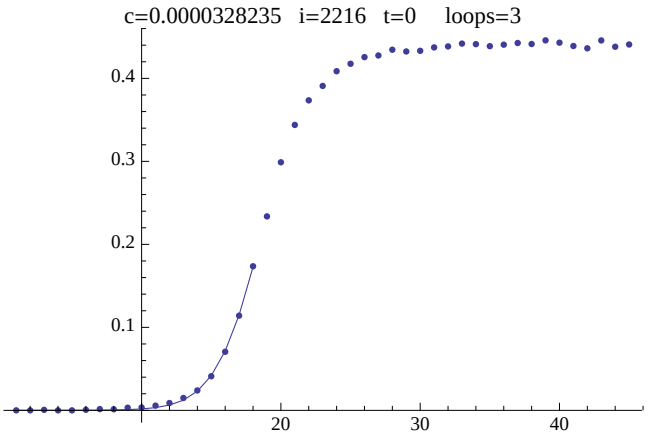
4.18288 10 i=1559 t=10 loops=2



$\{d0 \to 1.19103 \times 10^{-6}, k \to 0.0357843, base \to 0.000405981\}$

{Null}

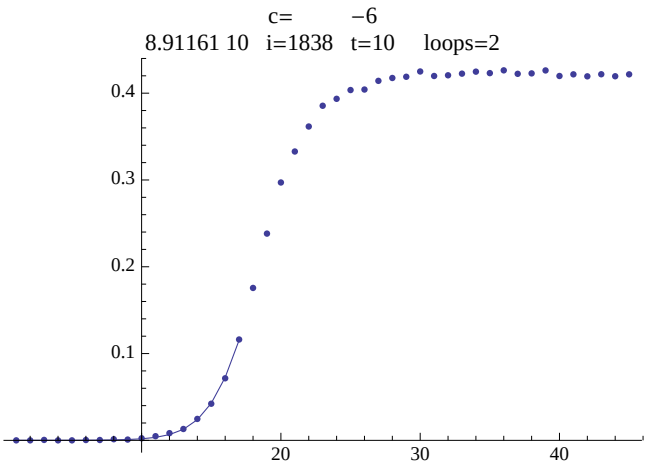
MAK2[X251data]



$\{d0 \to 1.58669 \times 10^{-6}, k \to 0.0466028, base \to 0.00011\}$

{Null}

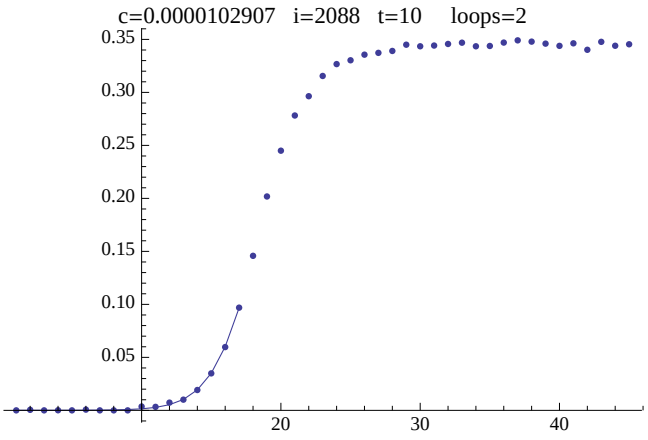
MAK2[X252data]



$\{d0 \to 1.65132 \times 10^{-6}, k \to 0.0440925, base \to 0.00011\}$

{Null}

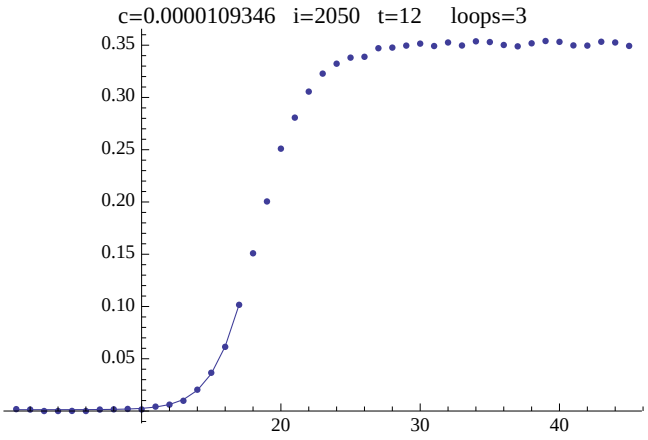
MAK2[X253data]



$$\{d0 \to 1.32244 \times 10^{-6},\ k \to 0.0398722,\ base \to 0.00011\}$$

{Null}

MAK2[X254data]

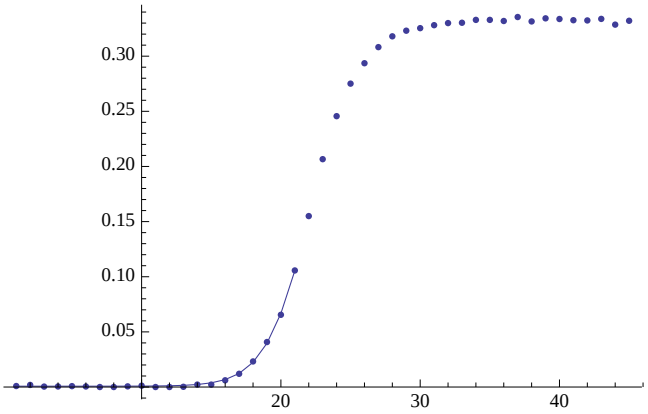


$$\{d0 \to 1.23903 \times 10^{-6},\ k \to 0.0507799,\ base \to 0.00126325\}$$

{Null}

MAK2[X311data]

c=0.0000133049 i=4046 t=0 loops=6

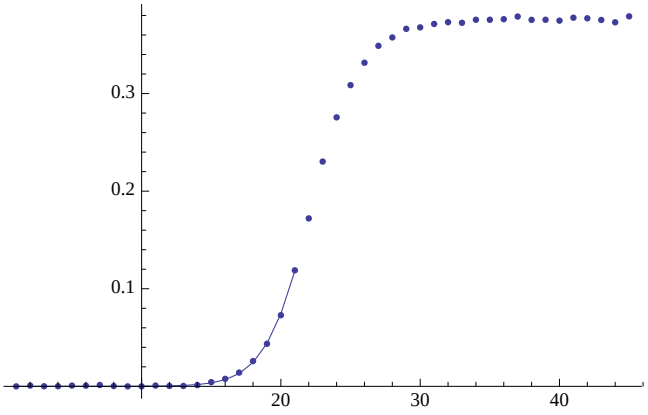


$\{d0 \to 9.47733 \times 10^{-8}, k \to 0.0393325, base \to 0.00074481\}$

{Null}

MAK2[X312data]

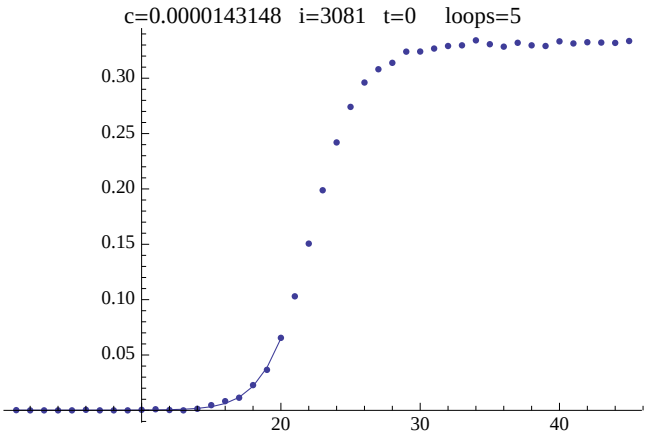
c=0.0000116049 i=1352 t=0 loops=2



$\{d0 \to 1.07018 \times 10^{-7}, k \to 0.0441896, base \to 0.0000750592\}$

{Null}

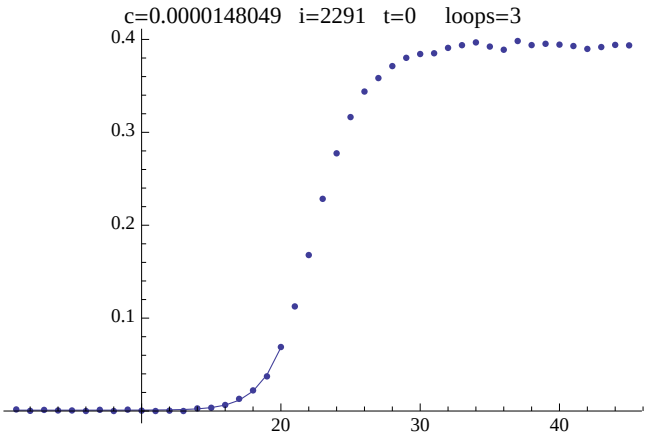
MAK2[X313data]



$\{d0 \to 9.49828 \times 10^{-8}, k \to 0.0365064, base \to 0.000229541\}$

{Null}

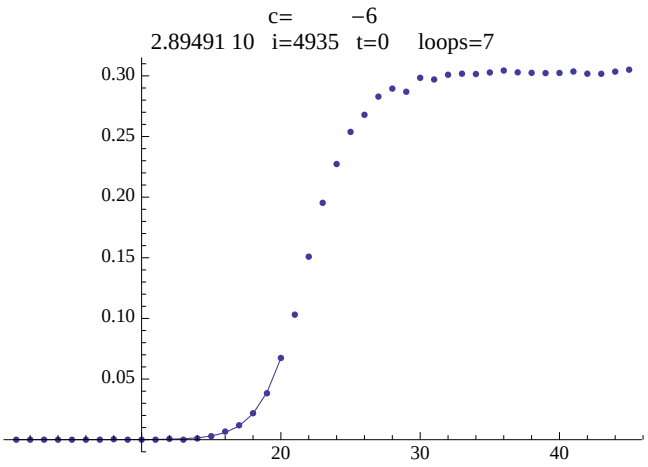
MAK2[X314data]



$\{d0 \to 8.51898 \times 10^{-8}, k \to 0.0589681, base \to 0.000915049\}$

{Null}

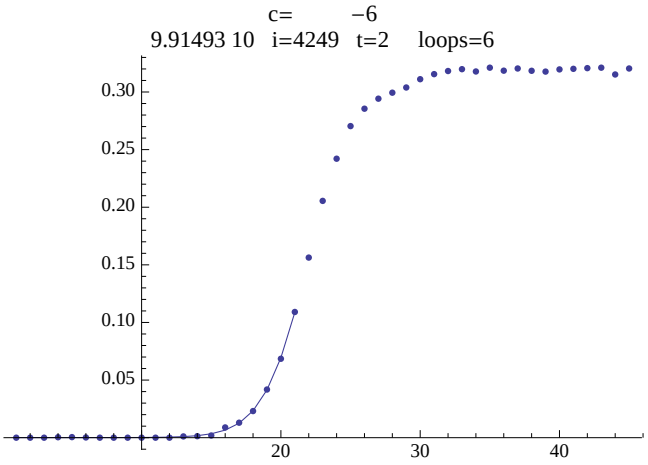
MAK2[X321data]



$\{d0 \to 9.14548 \times 10^{-8}, k \to 0.0461974, base \to 0.0000436121\}$

{Null}

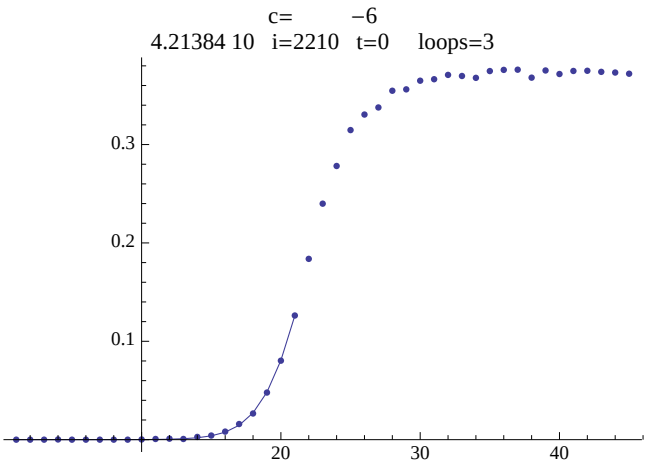
MAK2[X322data]



$\{d0 \to 1.03398 \times 10^{-7}, k \to 0.0377521, base \to 0.0000794433\}$

{Null}

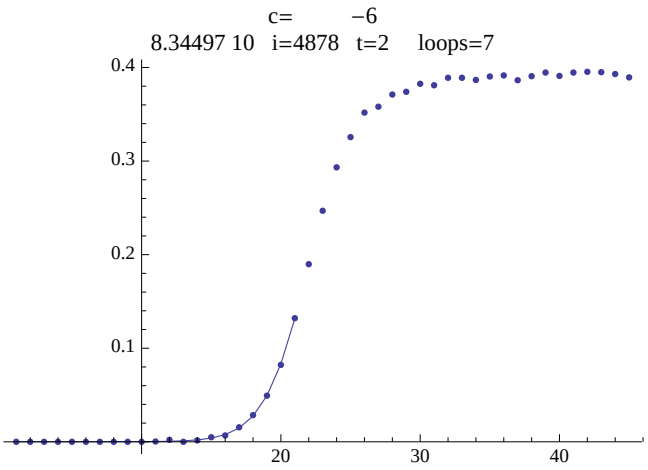
MAK2[X323data]



$$\{d0 \to 1.21782 \times 10^{-7},\ k \to 0.042771,\ base \to -0.0000291252\}$$

{Null}

MAK2[X324data]



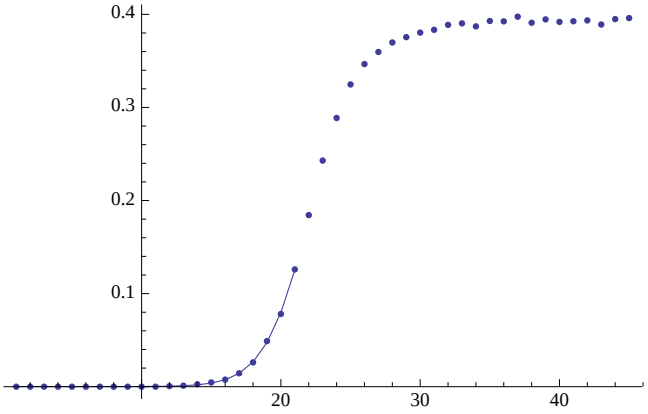
$$\{d0 \to 1.20887 \times 10^{-7},\ k \to 0.048242,\ base \to 0.0000760514\}$$

{Null}

MAK2[X331data]

c= −6

6.88424 10 i=1346 t=0 loops=2



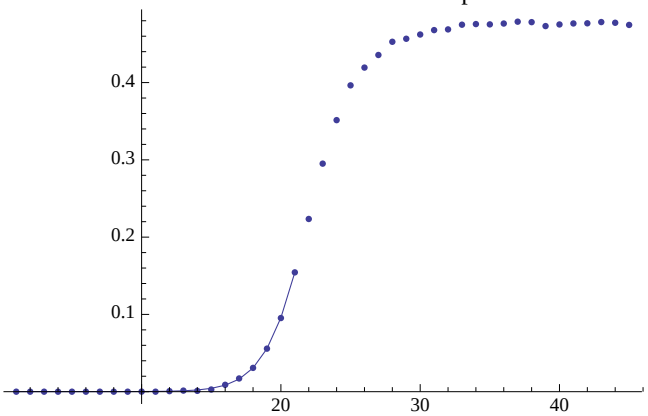
$\{d0 \to 1.17568 \times 10^{-7}, k \to 0.044436, base \to 0.000077565\}$

{Null}

MAK2[X332data]

c= −6

4.98427 10 i=2675 t=0 loops=4

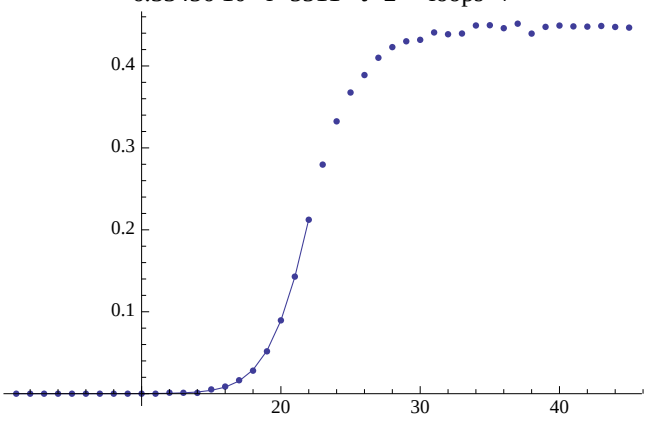


$\{d0 \to 1.31331 \times 10^{-7}, k \to 0.064237, base \to 0.0000761153\}$

{Null}

MAK2[X333data]

c= −6
6.33456 10 i=5511 t=2 loops=7

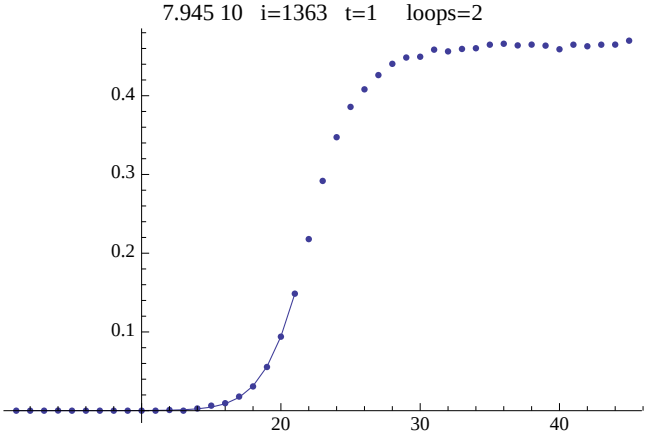


$\{d0 \to 1.26519 \times 10^{-7}, k \to 0.0550656, base \to 1.32218 \times 10^{-8}\}$

{Null}

MAK2[X334data]

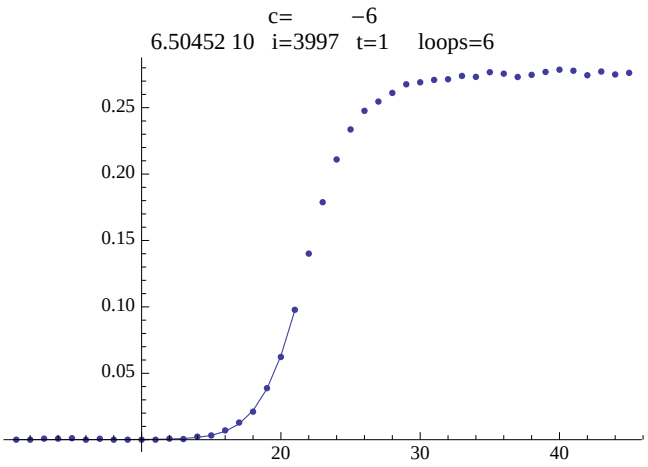
c= −6
7.945 10 i=1363 t=1 loops=2



$\{d0 \to 1.38001 \times 10^{-7}, k \to 0.0532945, base \to 0.000074867\}$

{Null}

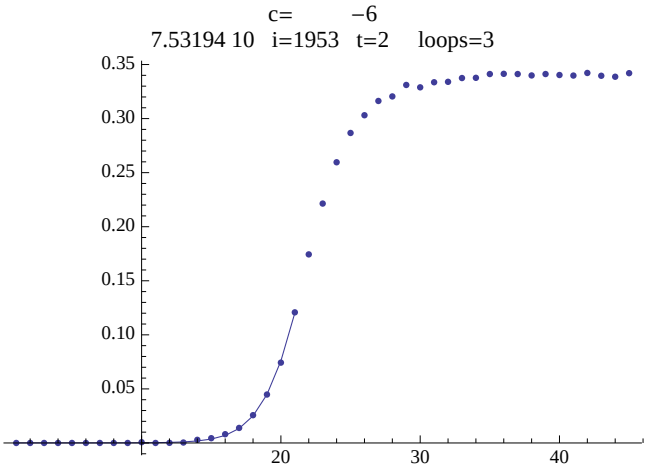
MAK2[X341data]



$\{d0 \to 9.95116 \times 10^{-8}, k \to 0.0303874, base \to 0.0000853477\}$

{Null}

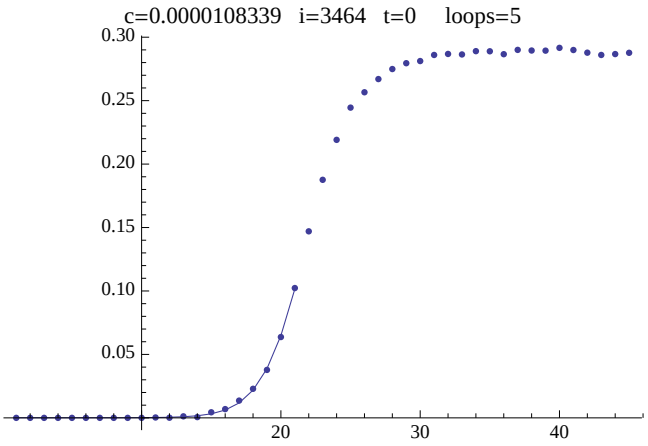
MAK2[X342data]



$\{d0 \to 1.09334 \times 10^{-7}, k \to 0.0447068, base \to 0.0000767723\}$

{Null}

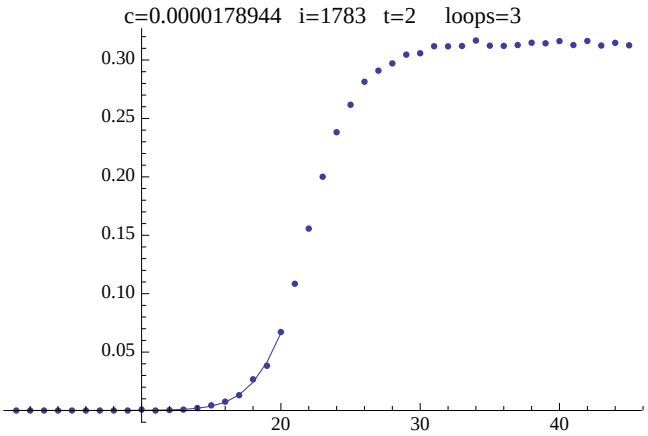
MAK2[X343data]



$\{d0 \to 9.68507 \times 10^{-8}, k \to 0.0350697, base \to 0.000079433\}$

{Null}

MAK2[X344data]



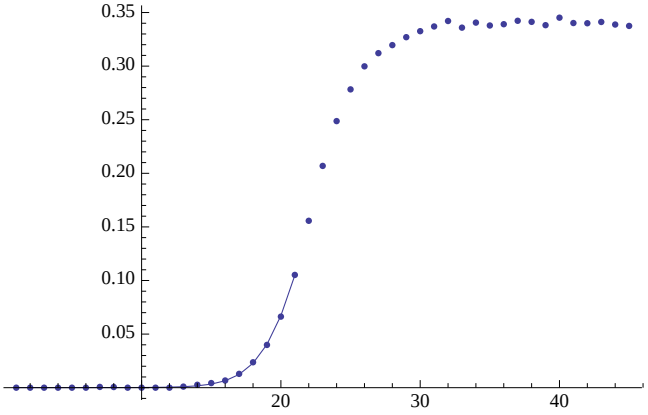
$\{d0 \to 1.14916 \times 10^{-7}, k \to 0.0266979, base \to 0.0000757949\}$

{Null}

MAK2[X351data]

c= −6

5.31468 10 i=4770 t=0 loops=7



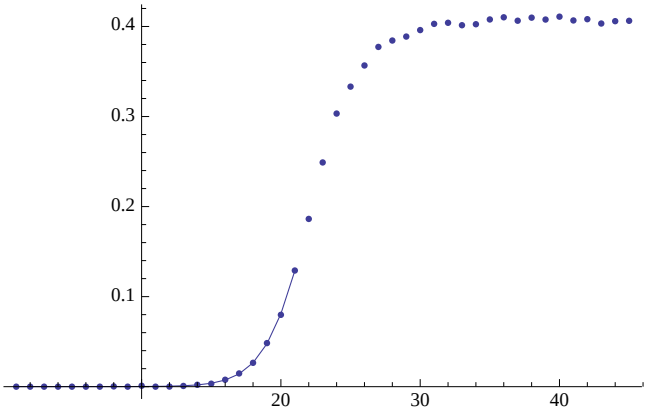
$\{d0 \to 1.01881 \times 10^{-7}, k \to 0.0351937, base \to 0.0000794228\}$

{Null}

MAK2[X352data]

c= −6

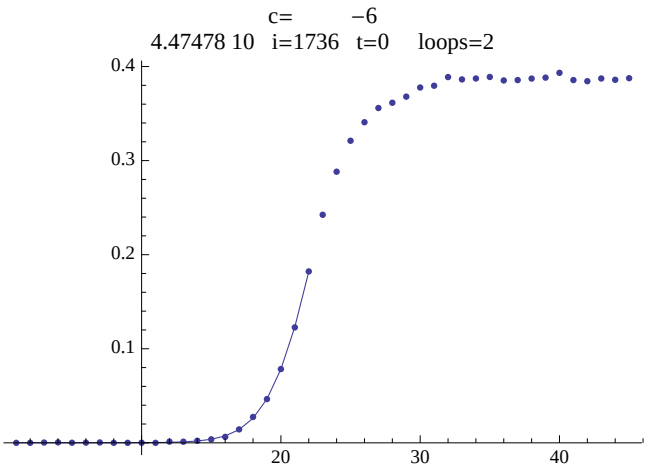
3.67486 10 i=4242 t=2 loops=6



$\{d0 \to 1.15451 \times 10^{-7}, k \to 0.0489108, base \to 0.000075758\}$

{Null}

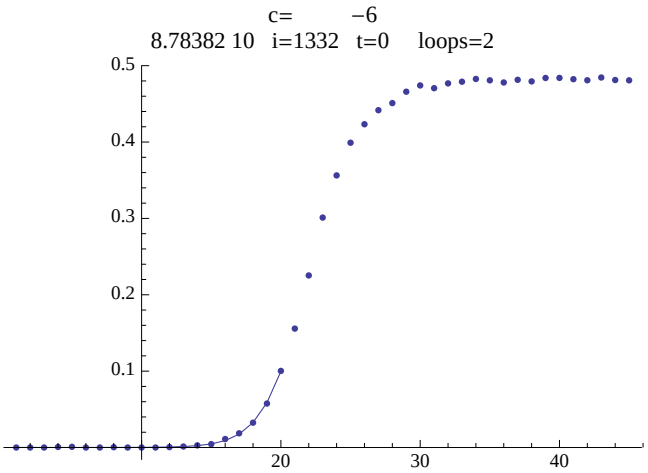
MAK2[X353data]



$\{d0 \to 1.15382 \times 10^{-7}, k \to 0.0438013, base \to 0.0000815814\}$

{Null}

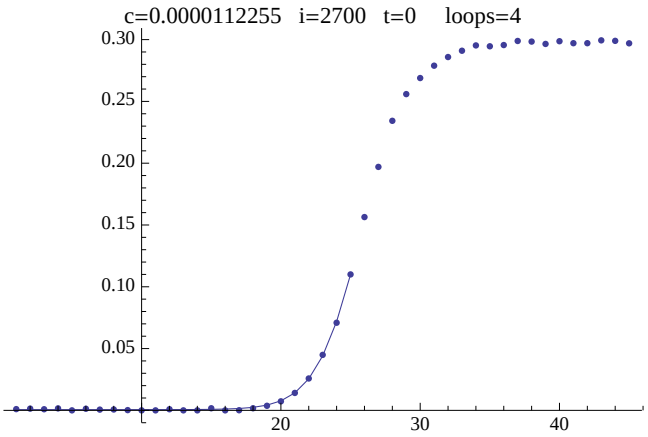
MAK2[X354data]



$\{d0 \to 1.42635 \times 10^{-7}, k \to 0.0598717, base \to 0.0000857774\}$

{Null}

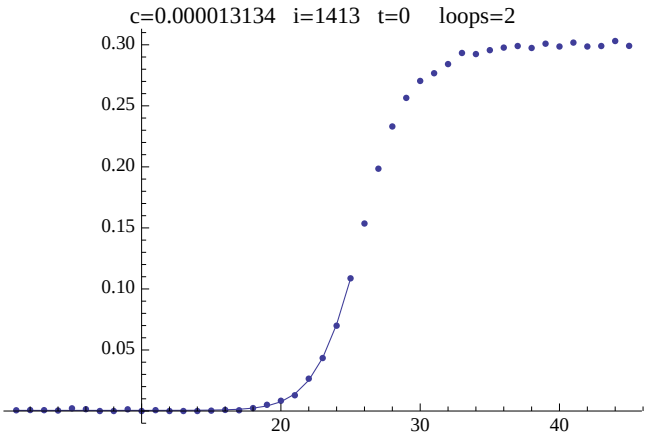
MAK2[X411data]



$$\{d0 \to 7.15979 \times 10^{-9},\ k \to 0.0331137,\ base \to 0.000578736\}$$

{Null}

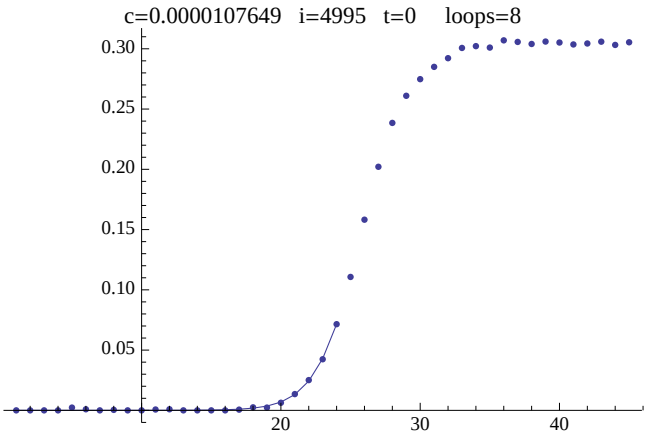
MAK2[X412data]



$$\{d0 \to 7.09357 \times 10^{-9},\ k \to 0.0325253,\ base \to 0.000521952\}$$

{Null}

MAK2[X413data]



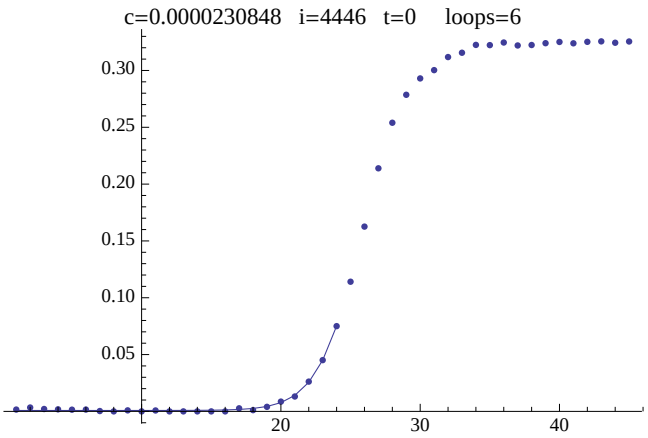
$$\{d0 \to 6.78437 \times 10^{-9},\ k \to 0.0372647,\ base \to 0.0000742077\}$$

{Null}

$$\{d0 \to 6.77392 \times 10^{-9},\ k \to 0.036774,\ base \to 0.000162683\}$$

{Null}

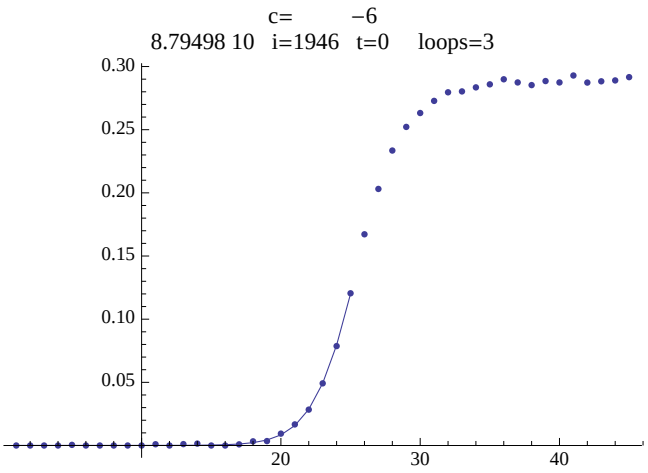
MAK2[X414data]



$$\{d0 \to 6.86123 \times 10^{-9},\ k \to 0.0413581,\ base \to 0.000800836\}$$

{Null}

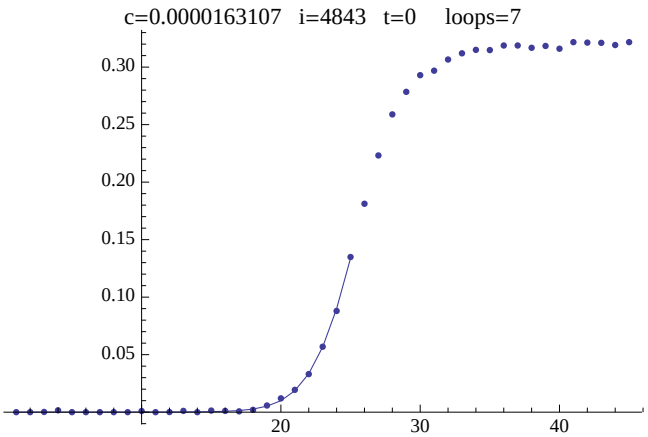
MAK2[X421data]



$$\{d0 \to 8.41739 \times 10^{-9},\ k \to 0.0332881,\ base \to 0.000078565\}$$

{Null}

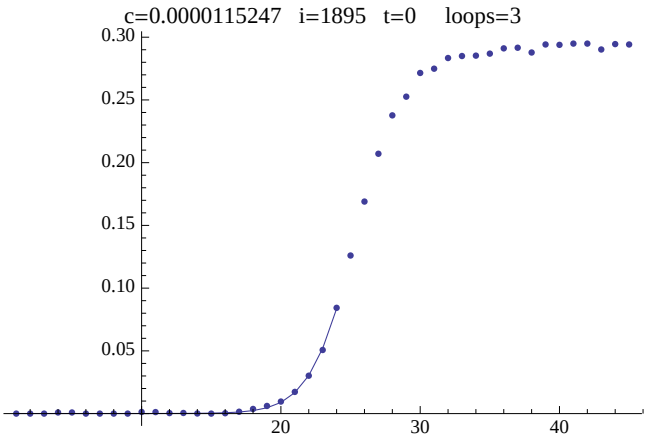
MAK2[X422data]



$$\{d0 \to 1.0139 \times 10^{-8},\ k \to 0.0339028,\ base \to 0.0000858234\}$$

{Null}

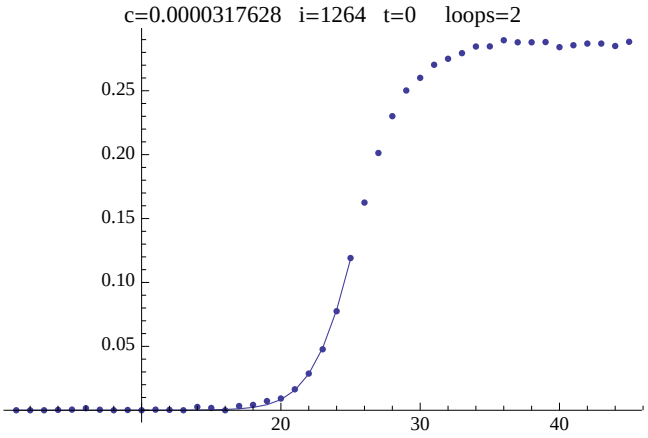
MAK2[X423data]



$$\{d0 \to 8.96456 \times 10^{-9},\ k \to 0.0342922,\ base \to 0.0000776909\}$$

{Null}

MAK2[X424data]

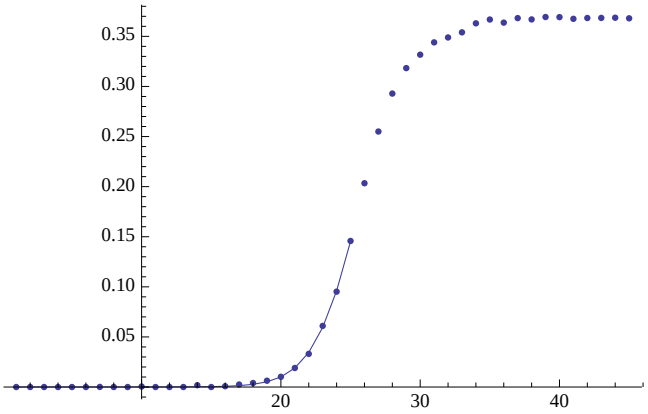


$$\{d0 \to 8.38342 \times 10^{-9},\ k \to 0.0323229,\ base \to 0.0000800686\}$$

{Null}

MAK2[X431data]

c=0.0000123247 i=4435 t=2 loops=7

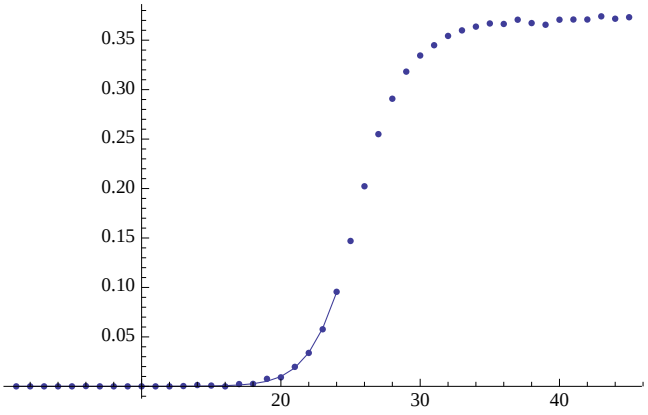


$\{d0 \to 1.0119 \times 10^{-8}, k \to 0.0406919, base \to 0.0000749599\}$

{Null}

MAK2[X432data]

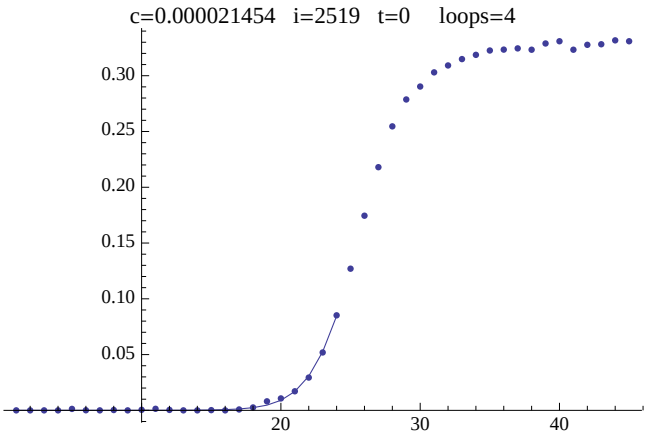
c=0.0000119948 i=4791 t=0 loops=7



$\{d0 \to 9.9279 \times 10^{-9}, k \to 0.0407538, base \to 0.0000788918\}$

{Null}

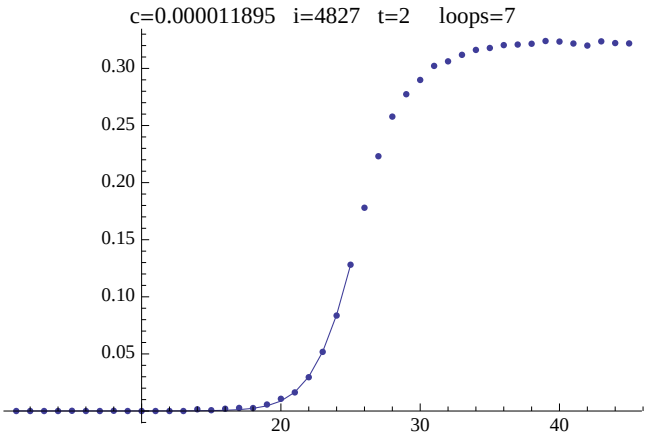
MAK2[X433data]



$\{d0 \to 9.06503 \times 10^{-9}, k \to 0.0347197, base \to 0.0000780145\}$

{Null}

MAK2[X434data]

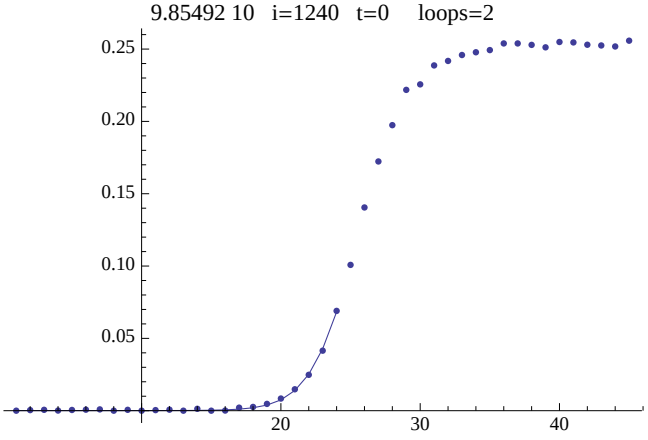


$\{d0 \to 8.75385 \times 10^{-9}, k \to 0.0364814, base \to 0.0000787434\}$

{Null}

MAK2[X441data]

c= −6
9.85492 10 i=1240 t=0 loops=2

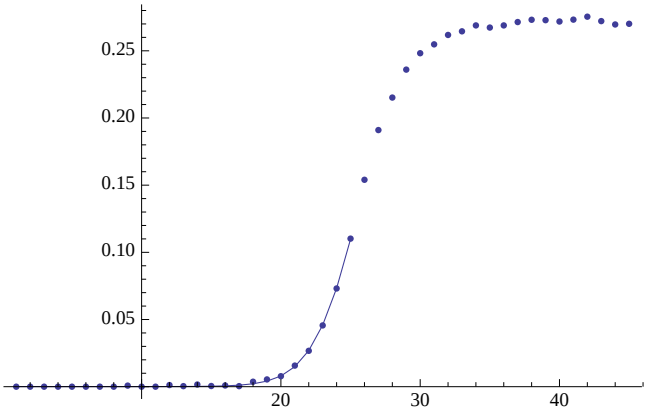


$\{d0 \to 7.5403 \times 10^{-9}, k \to 0.0266258, base \to 0.0000800432\}$

{Null}

MAK2[X442data]

c= −6
9.33296 10 i=1249 t=0 loops=2

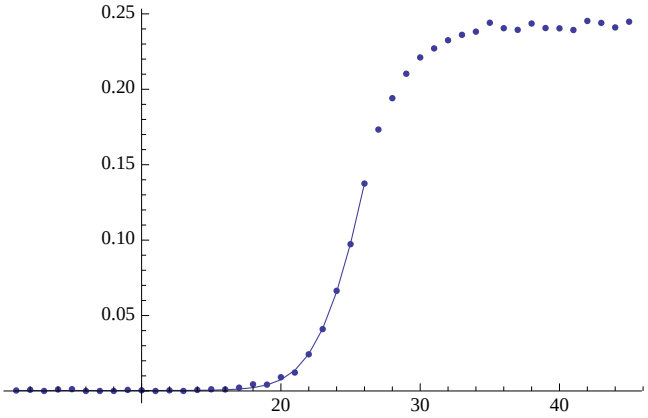


$\{d0 \to 8.03275 \times 10^{-9}, k \to 0.0289249, base \to 0.000078654\}$

{Null}

MAK2[X443data]

c=0.0000146349 i=4091 t=2 loops=6

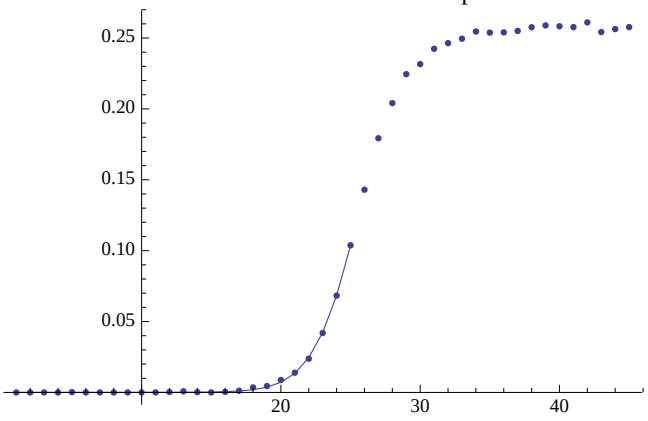


$\{d0 \to 7.29877 \times 10^{-9}, k \to 0.0250262, base \to 0.00029937\}$

{Null}

MAK2[X444data]

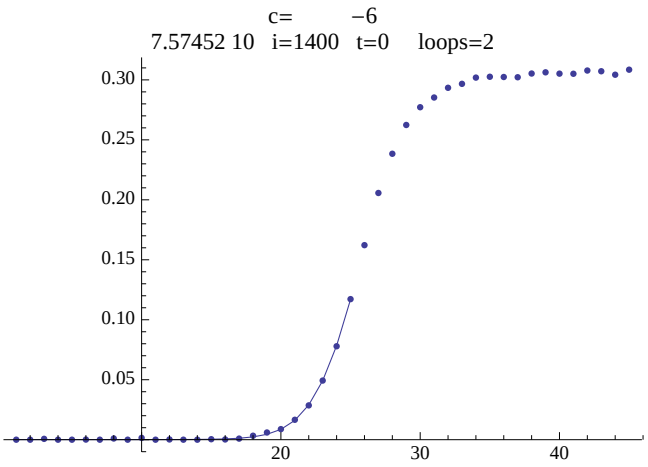
c= −6
7.41628 10 i=1411 t=0 loops=2



$\{d0 \to 7.18654 \times 10^{-9}, k \to 0.0290718, base \to 0.0000750314\}$

{Null}

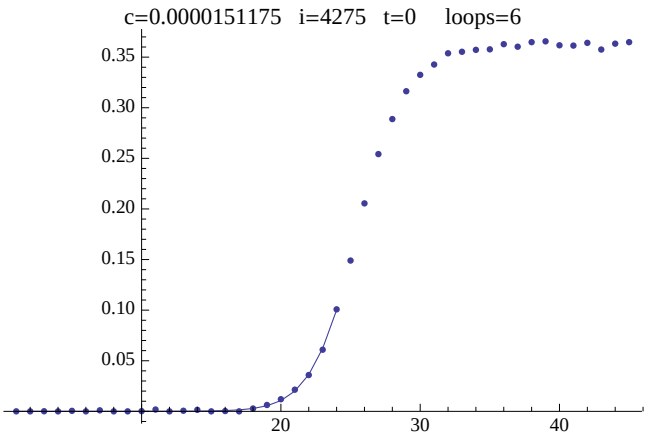
MAK2[X451data]



$\{d0 \to 8.72372 \times 10^{-9}, k \to 0.03015, base \to 0.0000807904\}$

{Null}

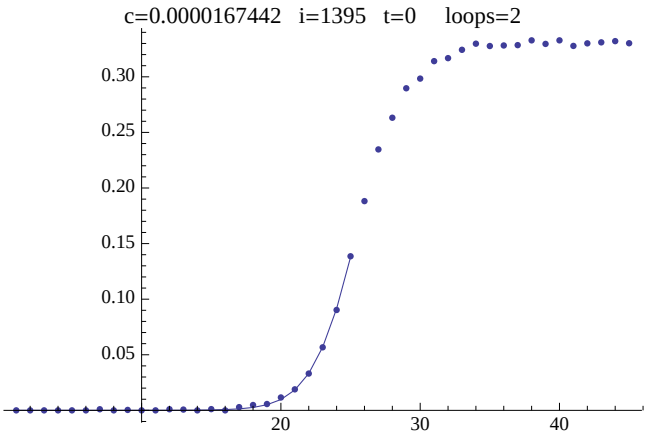
MAK2[X452data]



$\{d0 \to 1.07316 \times 10^{-8}, k \to 0.0411241, base \to 0.0000768858\}$

{Null}

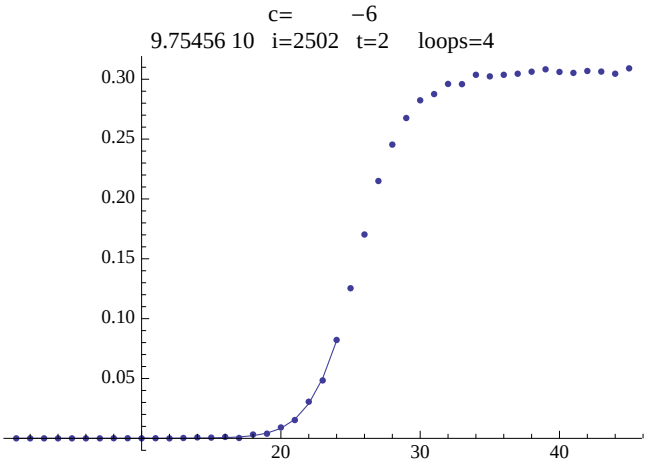
MAK2[X453data]



$\{d0 \to 9.82303 \times 10^{-9}, k \to 0.037433, base \to 0.0000763102\}$

{Null}

MAK2[X454data]

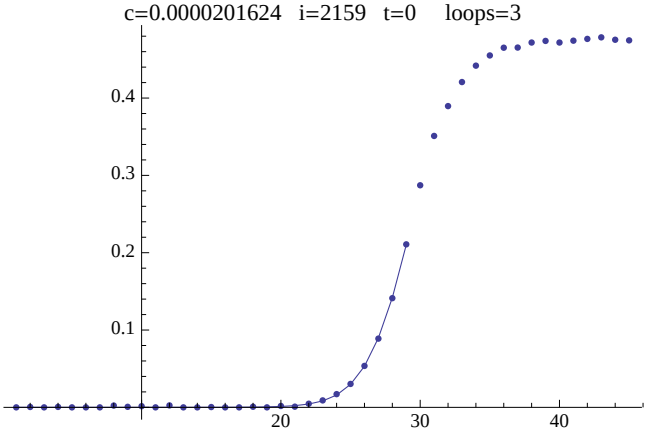


$\{d0 \to 8.40227 \times 10^{-9}, k \to 0.0359267, base \to 0.0000764992\}$

{Null}

MAK2[X511data]

c=0.0000201624 i=2159 t=0 loops=3

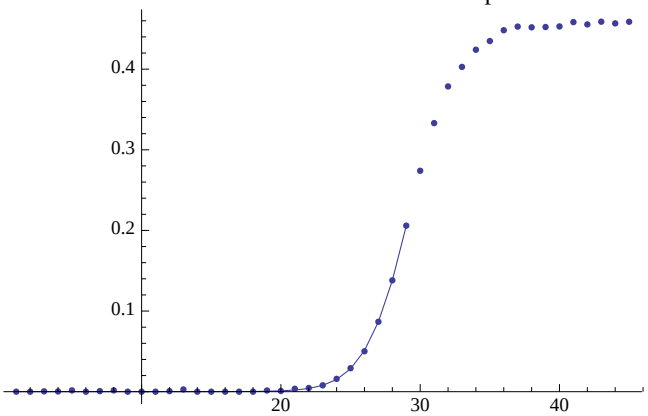


$\{d0 \to 1.01817 \times 10^{-9}, k \to 0.051871, base \to 0.000109388\}$

{Null}

MAK2[X512data]

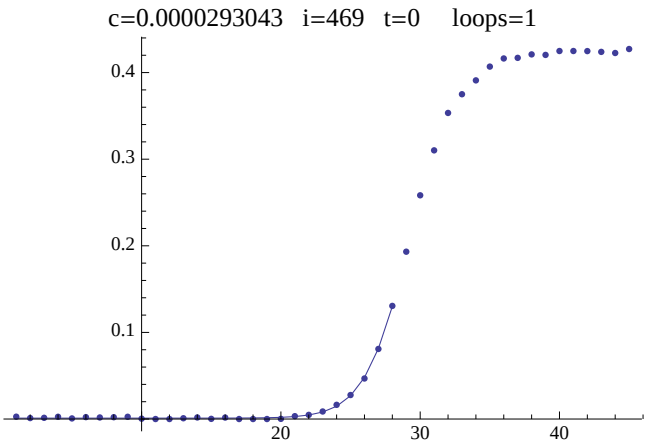
c=0.0000195243 i=468 t=0 loops=1



$\{d0 \to 9.64079 \times 10^{-10}, k \to 0.0527627, base \to 0.0000358996\}$

{Null}

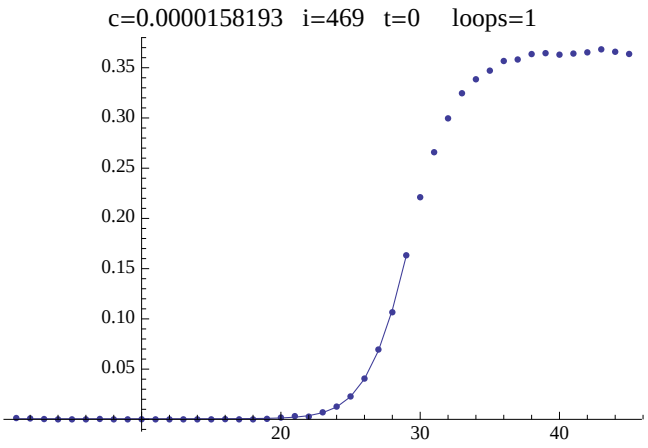
MAK2[X513data]



$\{d0 \to 8.73125 \times 10^{-10}, k \to 0.0520975, base \to 0.00102143\}$

{Null}

MAK2[X514data]



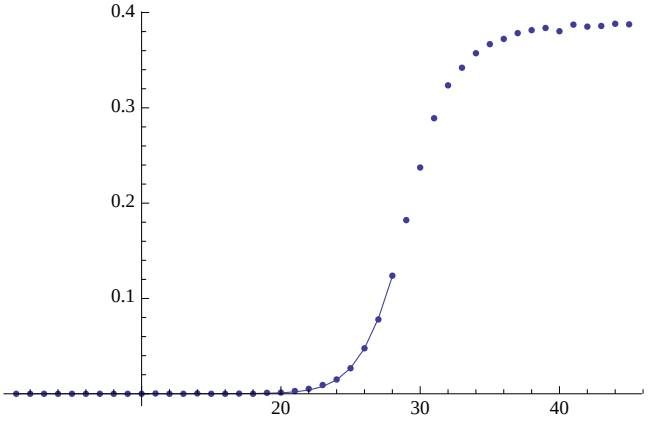
$\{d0 \to 7.42546 \times 10^{-10}, k \to 0.0426781, base \to 0.00060821\}$

{Null}

MAK2[X521data]

c= −6

7.77424 10 i=483 t=0 loops=1



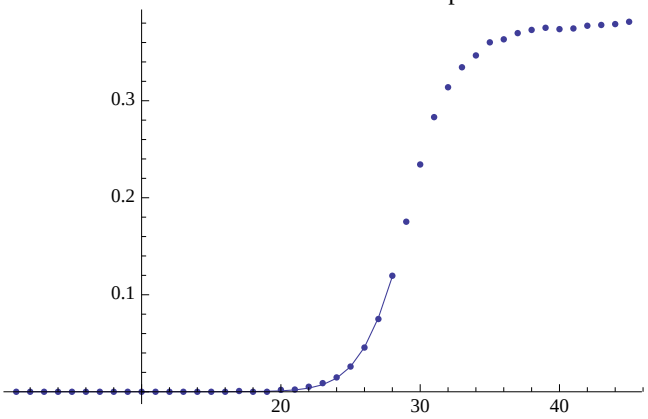
$\{d0 \to 9.43437 \times 10^{-10}, k \to 0.0408623, base \to 0.0000404776\}$

{Null}

MAK2[X522data]

c= −6

9.7405 10 i=468 t=0 loops=1

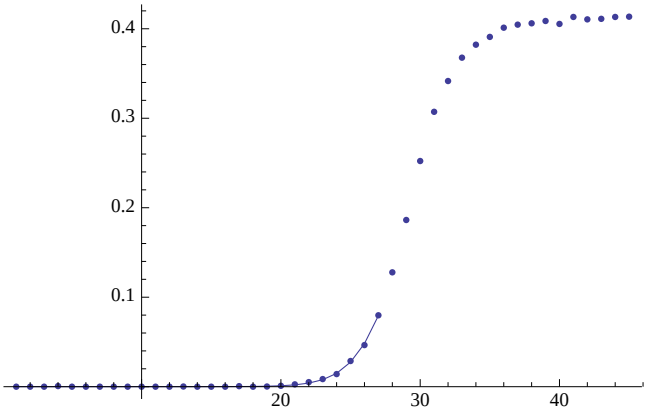


$\{d0 \to 9.07201 \times 10^{-10}, k \to 0.0395968, base \to 0.0000242696\}$

{Null}

MAK2[X523data]

c= −6
8.0469 10 i=342 t=0 loops=1

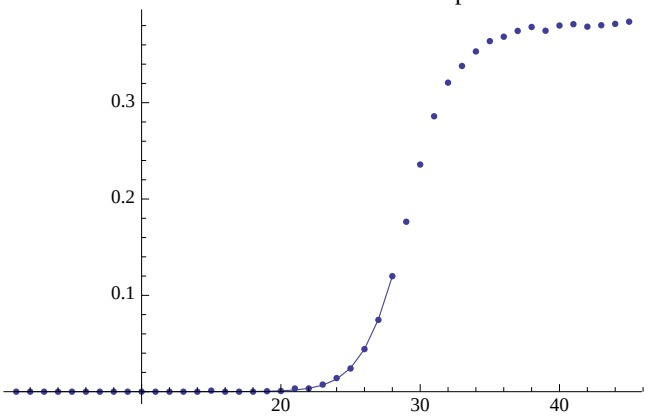


$\{d0 \to 9.7828 \times 10^{-10}, k \to 0.0382294, base \to 0.0000158112\}$

{Null}

MAK2[X524data]

c= −6
5.75499 10 i=467 t=0 loops=1

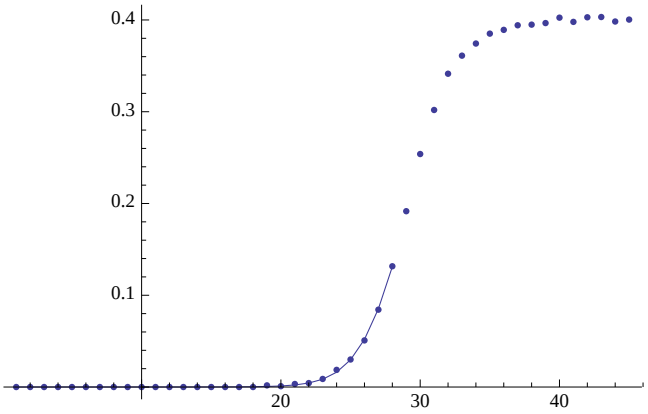


$\{d0 \to 8.31151 \times 10^{-10}, k \to 0.0463062, base \to 0.0000253395\}$

{Null}

MAK2[X531data]

c=0.0000120447 i=461 t=0 loops=1

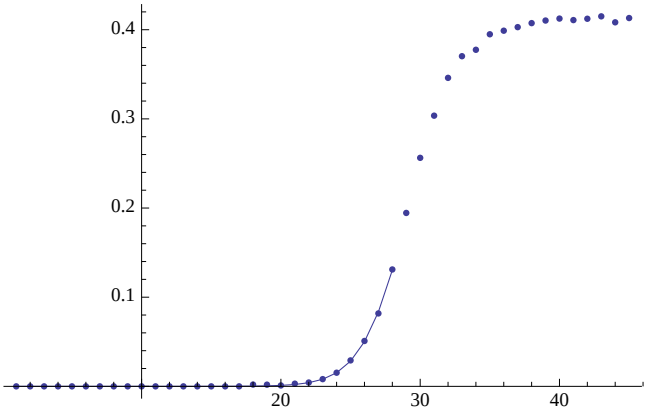


$\{d0 \to 1.05911 \times 10^{-9}, k \to 0.0404126, base \to 0.0000428602\}$

{Null}

MAK2[X532data]

c=0.0000105237 i=488 t=0 loops=1

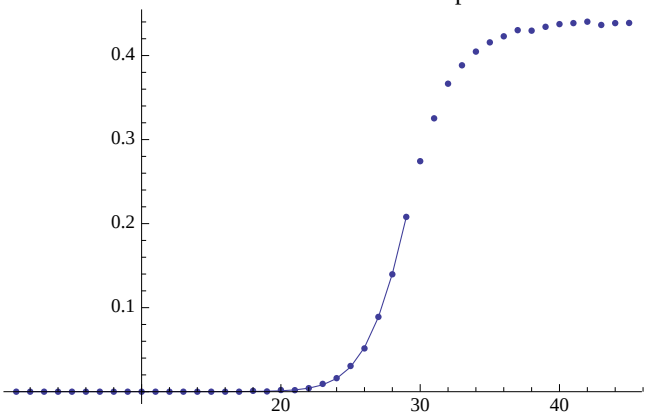


$\{d0 \to 9.87064 \times 10^{-10}, k \to 0.044004, base \to 0.0000437685\}$

{Null}

MAK2[X533data]

c= −6
6.07475 10 i=468 t=0 loops=1

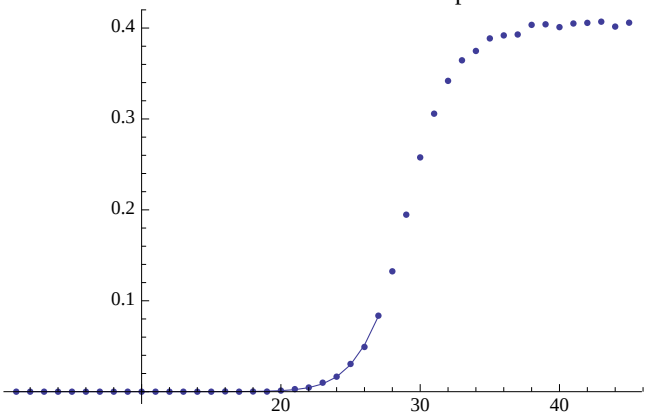


$\{d0 \to 1.00714 \times 10^{-9}, k \to 0.0512414, base \to 0.0000369569\}$

{Null}

MAK2[X534data]

c= −6
7.70419 10 i=491 t=0 loops=1



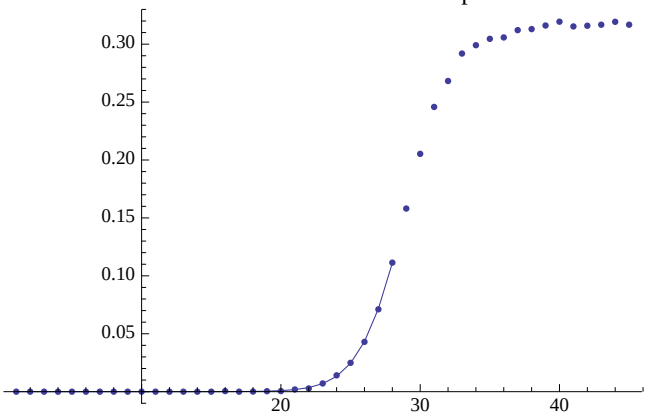
$\{d0 \to 1.08795 \times 10^{-9}, k \to 0.0354791, base \to -4.64611 \times 10^{-6}\}$

{Null}

MAK2[X541data]

c= −6

2.30451 10 i=2121 t=4 loops=3



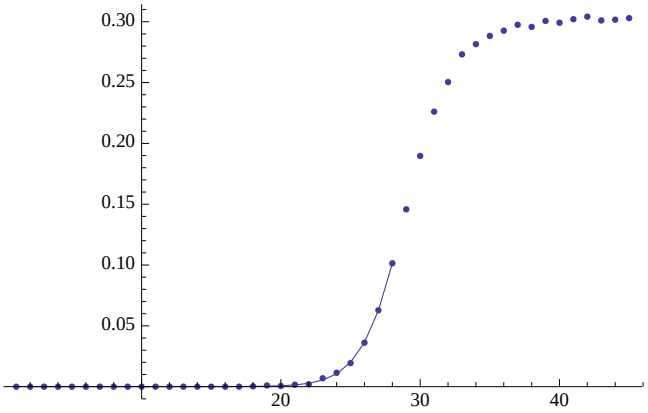
$\{d0 \to 8.66032 \times 10^{-10},\ k \to 0.0360034,\ base \to -0.0000174536\}$

{Null}

MAK2[X542data]

c= −6

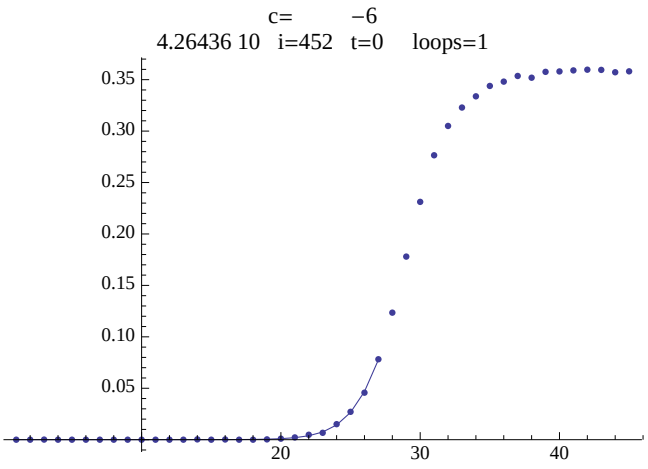
4.28093 10 i=367 t=0 loops=1



$\{d0 \to 6.66163 \times 10^{-10},\ k \to 0.0429498,\ base \to 0.0000453044\}$

{Null}

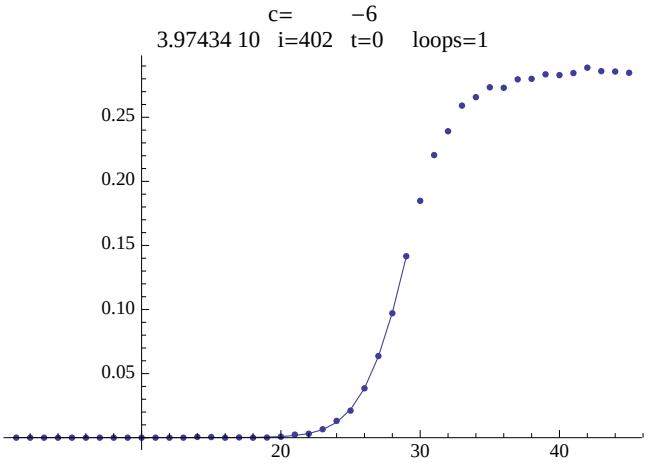
MAK2[X543data]



$\{d0 \to 9.3136 \times 10^{-10},\ k \to 0.0396673,\ base \to 0.0000202784\}$

{Null}

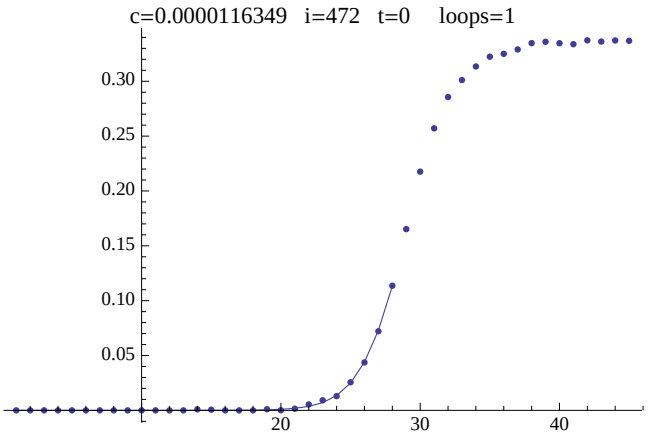
MAK2[X544data]



$\{d0 \to 7.81348 \times 10^{-10},\ k \to 0.0303894,\ base \to 0.0000580525\}$

{Null}

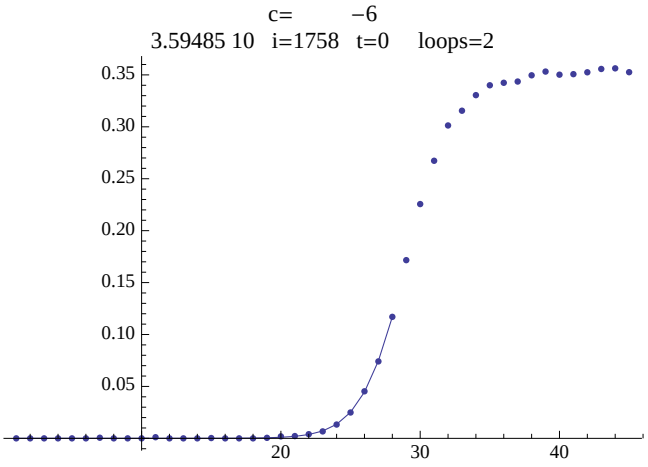
MAK2[X551data]



$\{d0 \to 8.78468 \times 10^{-10}, k \to 0.0369423, base \to 0.0000289688\}$

{Null}

MAK2[X552data]

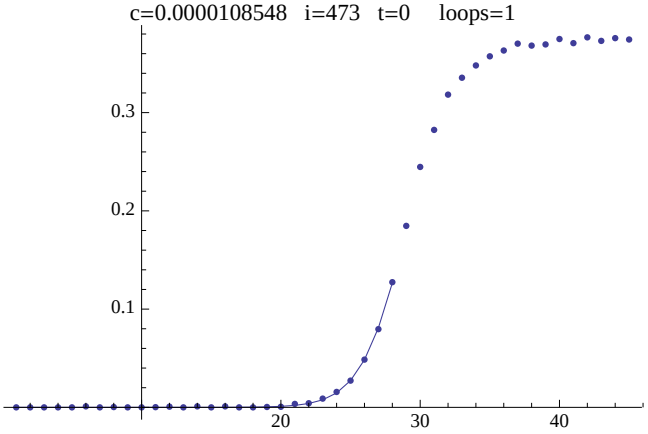


$\{d0 \to 8.68859 \times 10^{-10}, k \to 0.0405325, base \to 0.00011\}$

{Null}

MAK2[X553data]

c=0.0000108548 i=473 t=0 loops=1

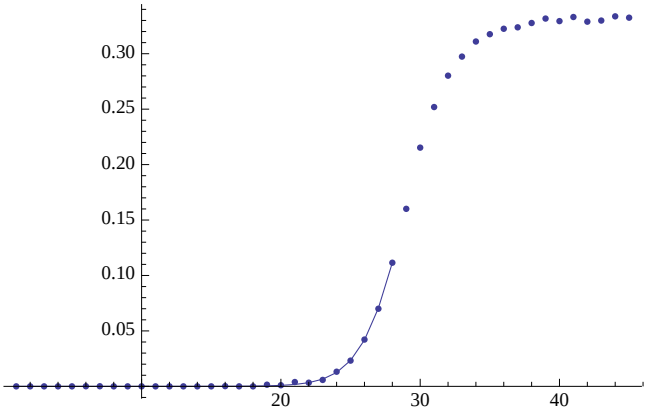


$\{d0 \to 9.49239 \times 10^{-10},\ k \to 0.0433327,\ base \to 0.0000393072\}$

{Null}

MAK2[X554data]

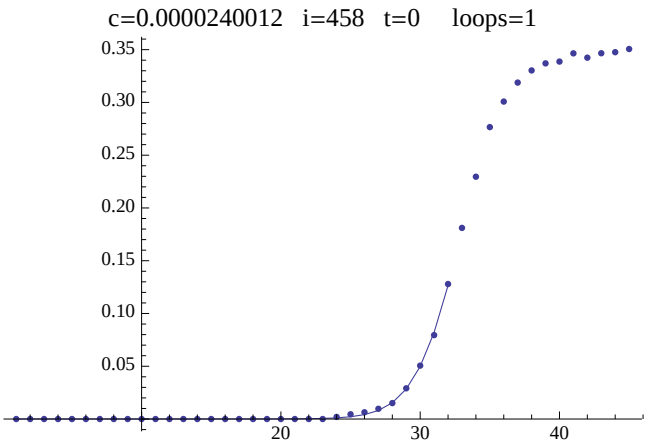
c= −6
7.57464 10 i=449 t=0 loops=1



$\{d0 \to 8.0202 \times 10^{-10},\ k \to 0.0406658,\ base \to 0.0000293812\}$

{Null}

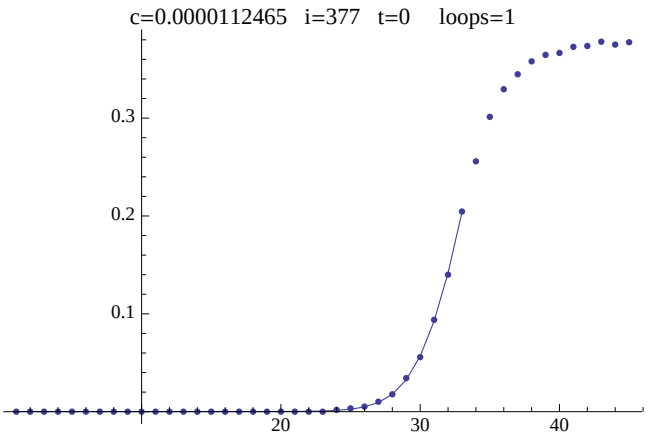
MAK2[X611data]



$\{d0 \to 6.31701 \times 10^{-11}, k \to 0.039586, base \to 0.0000581207\}$

{Null}

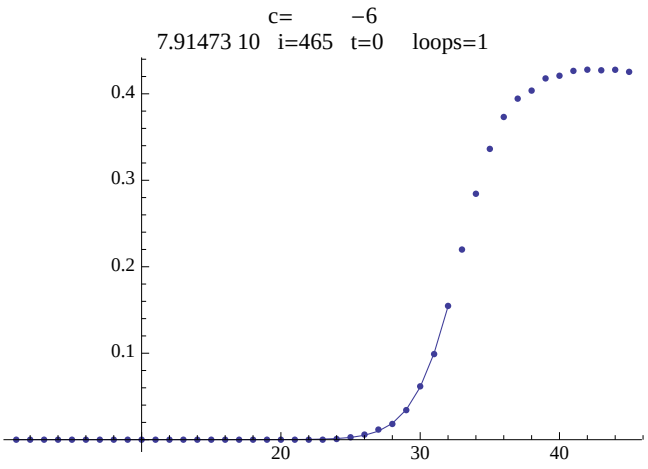
MAK2[X612data]



$\{d0 \to 7.35119 \times 10^{-11}, k \to 0.0421222, base \to 0.0000805136\}$

{Null}

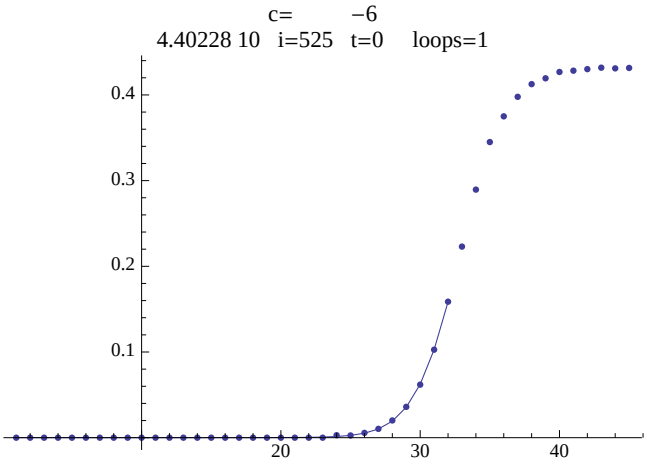
MAK2[X613data]



$$\{d0 \to 7.71399 \times 10^{-11},\ k \to 0.0480589,\ base \to 0.0000440631\}$$

{Null}

MAK2[X614data]

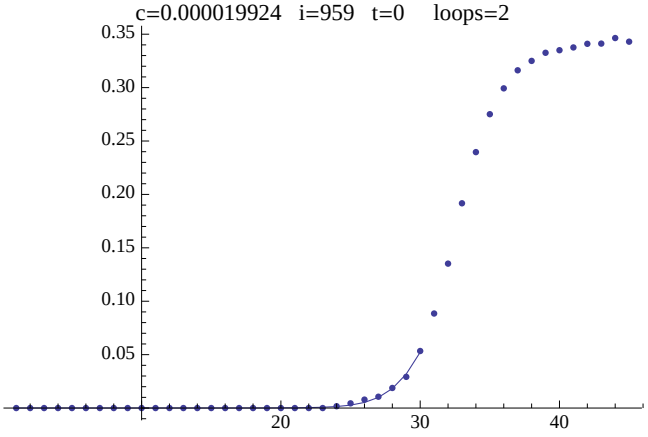


$$\{d0 \to 7.89714 \times 10^{-11},\ k \to 0.0497116,\ base \to 0.0000593716\}$$

{Null}

MAK2[X621data]

c=0.000019924 i=959 t=0 loops=2

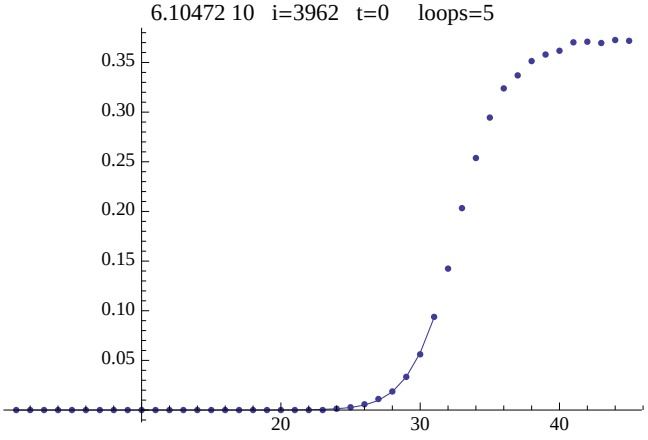


$\{d0 \to 8.14092 \times 10^{-11}, k \to 0.0245, base \to 0.0000735998\}$

{Null}

MAK2[X622data]

c= −6
6.10472 10 i=3962 t=0 loops=5

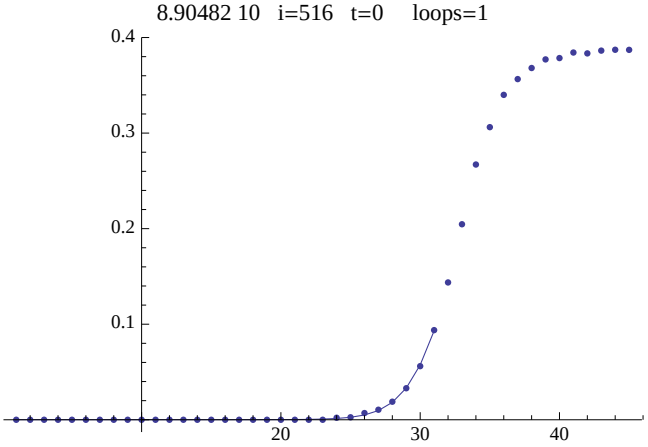


$\{d0 \to 7.64004 \times 10^{-11}, k \to 0.0398124, base \to 0.0000127666\}$

{Null}

MAK2[X623data]

c= −6
8.90482 10 i=516 t=0 loops=1

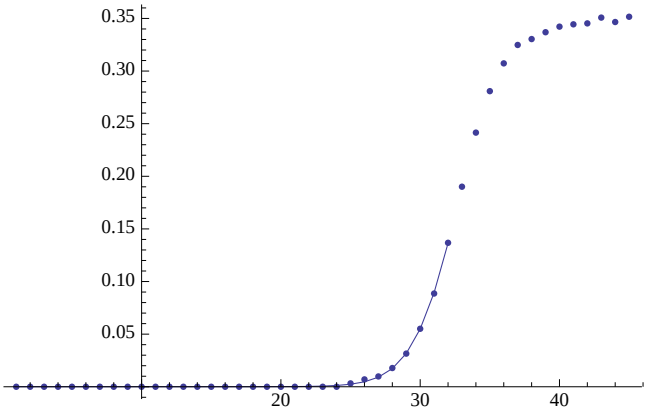


$\{d0 \to 7.54947 \times 10^{-11}, k \to 0.0404688, base \to 0.0000892971\}$

{Null}

MAK2[X624data]

c= −6
9.69469 10 i=446 t=0 loops=1

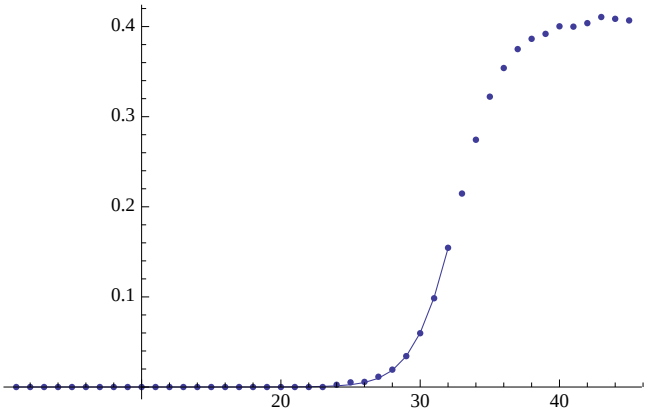


$\{d0 \to 7.16146 \times 10^{-11}, k \to 0.039938, base \to 0.0000305108\}$

{Null}

MAK2[X631data]

c=0.0000146343 i=427 t=0 loops=1



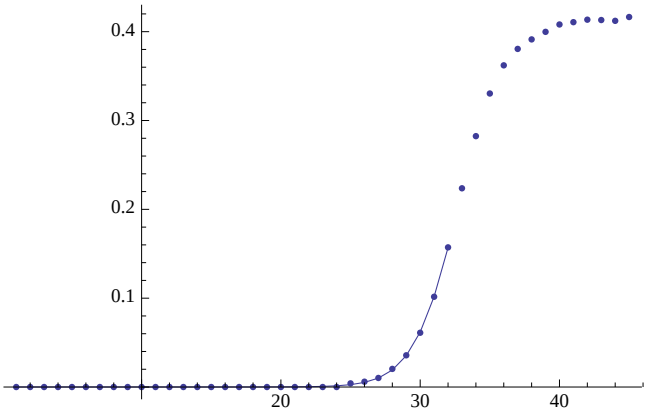
$\{d0 \to 7.5387 \times 10^{-11}, k \to 0.0494609, base \to 0.0000530316\}$

{Null}

MAK2[X632data]

c= −6

7.82491 10 i=450 t=0 loops=1

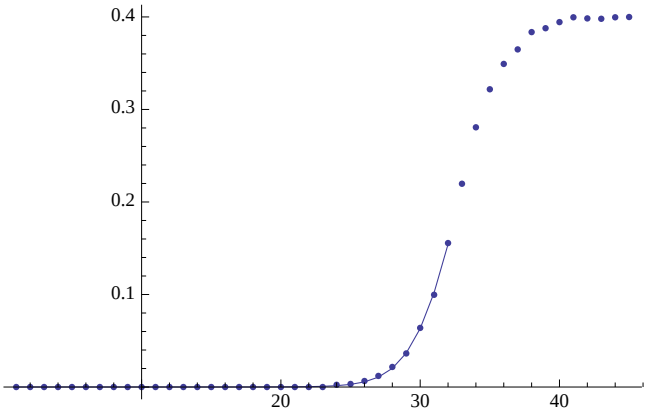


$\{d0 \to 7.84571 \times 10^{-11}, k \to 0.048957, base \to 0.0000569023\}$

{Null}

MAK2[X633data]

c=0.0000147622 i=468 t=0 loops=1

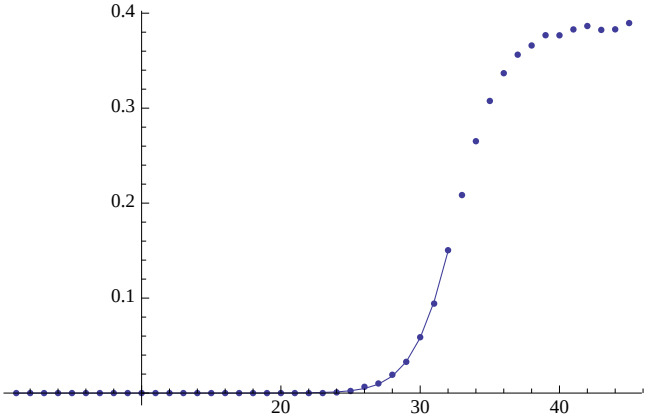


$$\{d0 \to 8.43425 \times 10^{-11},\ k \to 0.042922,\ base \to 0.0000607115\}$$

{Null}

MAK2[X634data]

c=0.0000130537 i=520 t=0 loops=1



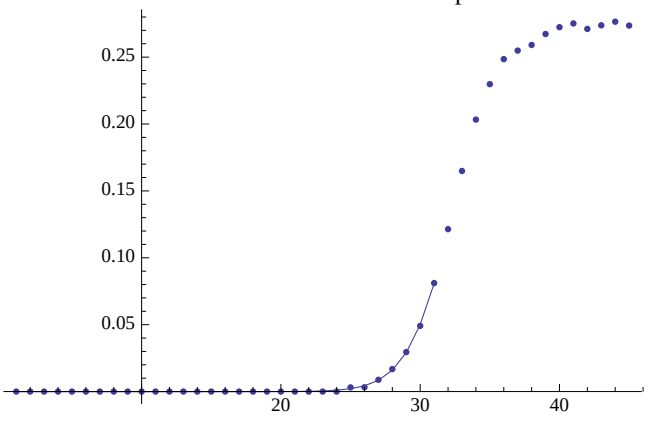
$$\{d0 \to 7.27038 \times 10^{-11},\ k \to 0.0484093,\ base \to 0.0000198556\}$$

{Null}

MAK2[X641data]

c= −6

5.7062 10 i=2629 t=0 loops=4



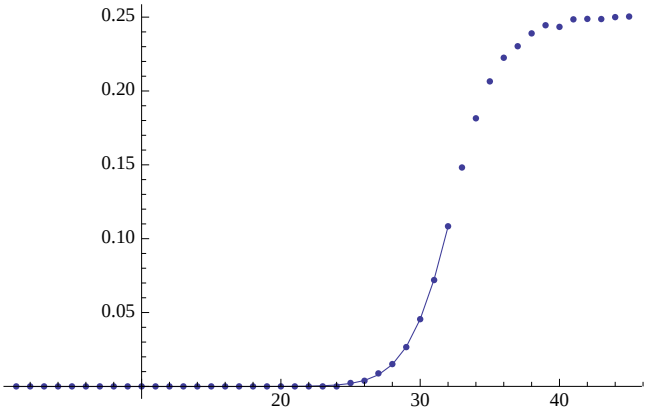
$\{d0 \to 6.77079 \times 10^{-11}, k \to 0.0332395, base \to -0.00010404\}$

{Null}

MAK2[X642data]

c= −6

2.81491 10 i=5688 t=6 loops=6

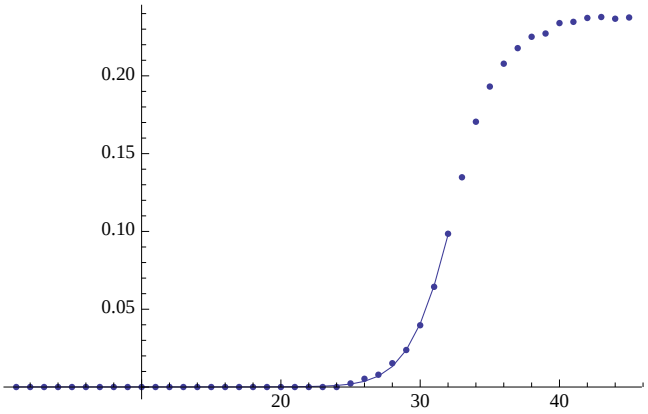


$\{d0 \to 6.34769 \times 10^{-11}, k \to 0.0277117, base \to -0.00010999\}$

{Null}

MAK2[X643data]

c=0.0000116747 i=372 t=0 loops=1



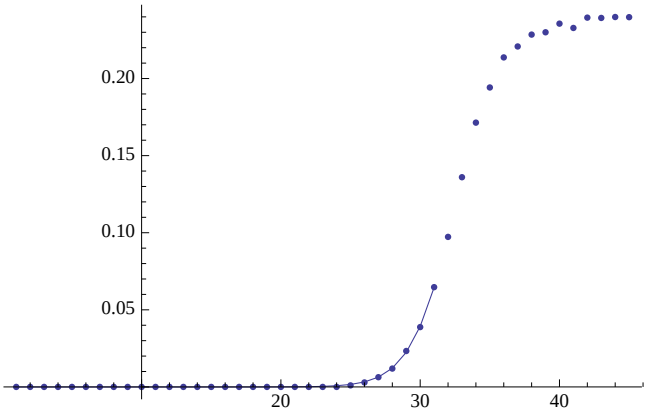
$\{d0 \to 5.5191 \times 10^{-11}, k \to 0.0261687, base \to 0.0000821592\}$

{Null}

MAK2[X644data]

c= −6

2.36496 10 i=5006 t=4 loops=6



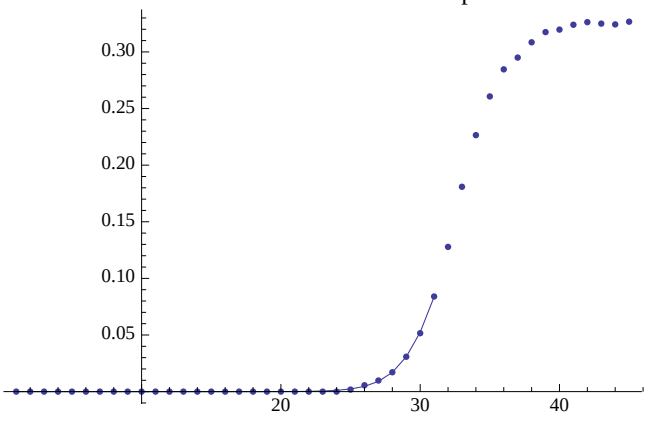
$\{d0 \to 5.03784 \times 10^{-11}, k \to 0.0303454, base \to -0.0000646715\}$

{Null}

MAK2[X651data]

c= −6

4.37457 10 i=2608 t=0 loops=4



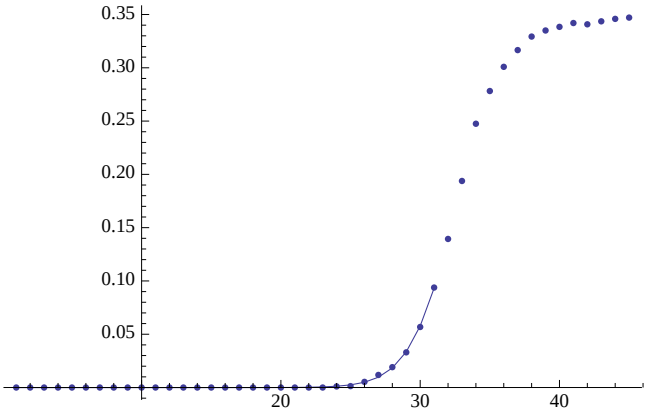
$\{d0 \to 7.25606 \times 10^{-11}, k \to 0.0325295, base \to -0.0000738649\}$

{Null}

MAK2[X652data]

c= −6

8.53483 10 i=4484 t=4 loops=7



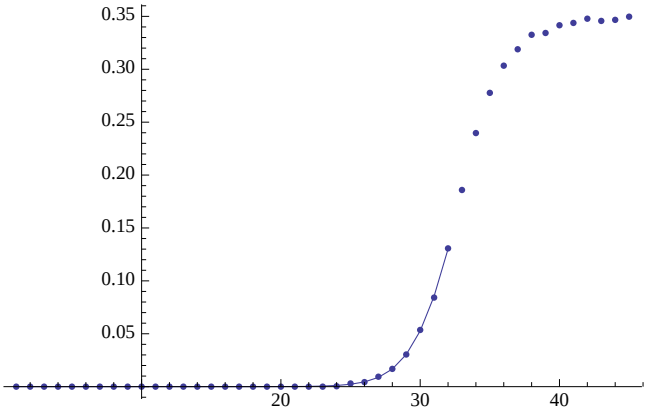
$\{d0 \to 7.73279 \times 10^{-11}, k \to 0.0391158, base \to -0.0000802227\}$

{Null}

MAK2[X653data]

c= −6

5.04484 10 i=2792 t=0 loops=3

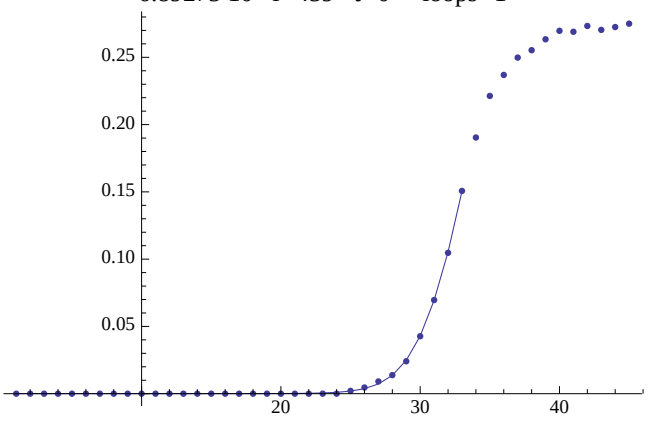


$$\{d0 \to 6.94069 \times 10^{-11},\ k \to 0.0373462,\ base \to -0.0000350165\}$$

{Null}

MAK2[X654data]

c= −6
6.89275 10 i=459 t=0 loops=1



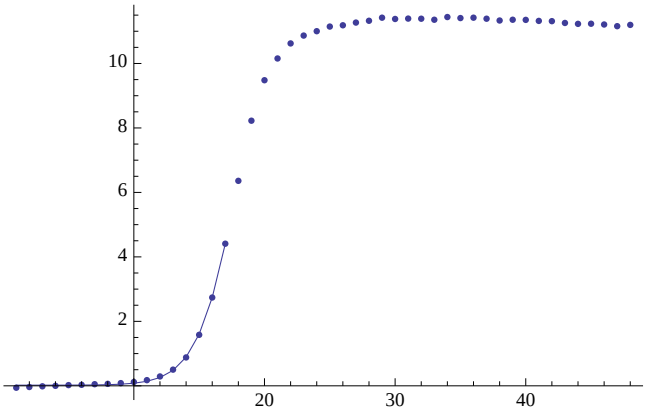
$\{d0 \to 5.66489 \times 10^{-11}, k \to 0.0298845, base \to 0.0000617769\}$

{Null}

The following are data and trials from the 'reps.csv' dataset.

```
indata = Import["reps.csv"];
cycle = indata[[All, 1]][[2 ;;]];

F11data = Transpose[{cycle, indata[[All, 3]][[2 ;;]]}];
F12data = Transpose[{cycle, indata[[All, 4]][[2 ;;]]}];
F13data = Transpose[{cycle, indata[[All, 5]][[2 ;;]]}];
F14data = Transpose[{cycle, indata[[All, 6]][[2 ;;]]}];
F21data = Transpose[{cycle, indata[[All, 7]][[2 ;;]]}];
F22data = Transpose[{cycle, indata[[All, 8]][[2 ;;]]}];
F23data = Transpose[{cycle, indata[[All, 9]][[2 ;;]]}];
F24data = Transpose[{cycle, indata[[All, 10]][[2 ;;]]}];
F31data = Transpose[{cycle, indata[[All, 11]][[2 ;;]]}];
F32data = Transpose[{cycle, indata[[All, 12]][[2 ;;]]}];
F33data = Transpose[{cycle, indata[[All, 13]][[2 ;;]]}];
F34data = Transpose[{cycle, indata[[All, 14]][[2 ;;]]}];
F41data = Transpose[{cycle, indata[[All, 15]][[2 ;;]]}];
F42data = Transpose[{cycle, indata[[All, 16]][[2 ;;]]}];
F43data = Transpose[{cycle, indata[[All, 17]][[2 ;;]]}];
F44data = Transpose[{cycle, indata[[All, 18]][[2 ;;]]}];
F51data = Transpose[{cycle, indata[[All, 19]][[2 ;;]]}];
F52data = Transpose[{cycle, indata[[All, 20]][[2 ;;]]}];
F53data = Transpose[{cycle, indata[[All, 21]][[2 ;;]]}];
F54data = Transpose[{cycle, indata[[All, 22]][[2 ;;]]}];
F61data = Transpose[{cycle, indata[[All, 23]][[2 ;;]]}];
F62data = Transpose[{cycle, indata[[All, 24]][[2 ;;]]}];
F63data = Transpose[{cycle, indata[[All, 25]][[2 ;;]]}];
F64data = Transpose[{cycle, indata[[All, 26]][[2 ;;]]}];
F71data = Transpose[{cycle, indata[[All, 27]][[2 ;;]]}];
F72data = Transpose[{cycle, indata[[All, 28]][[2 ;;]]}];
F73data = Transpose[{cycle, indata[[All, 29]][[2 ;;]]}];
F74data = Transpose[{cycle, indata[[All, 30]][[2 ;;]]}];

MAK2[F11data]
```

c=0.0183563 i=5151 t=0 loops=5

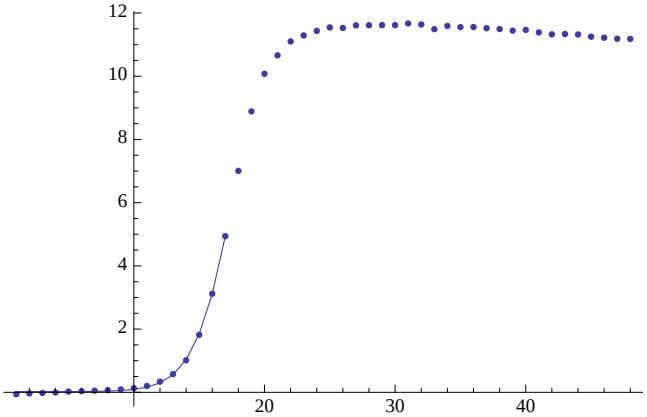



```
{d0 → 0.0000598625, k → 1.81921, base → 0.0195575}
```

```
{Null}
```

MAK2[F12data]

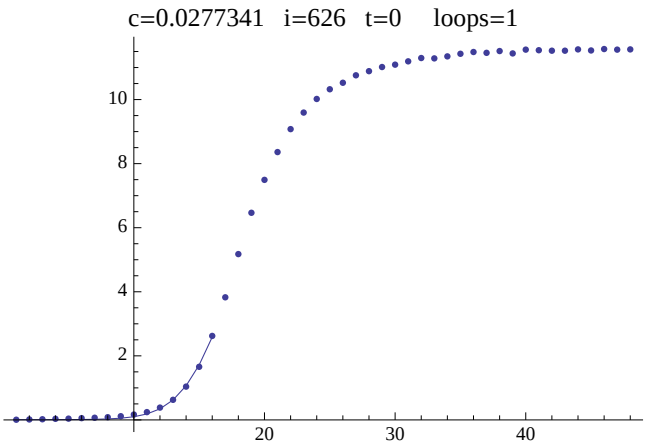
c=0.019498 i=2184 t=0 loops=2




```
{d0 → 0.0000705565, k → 1.8739, base → 0.0203246}
```

```
{Null}
```

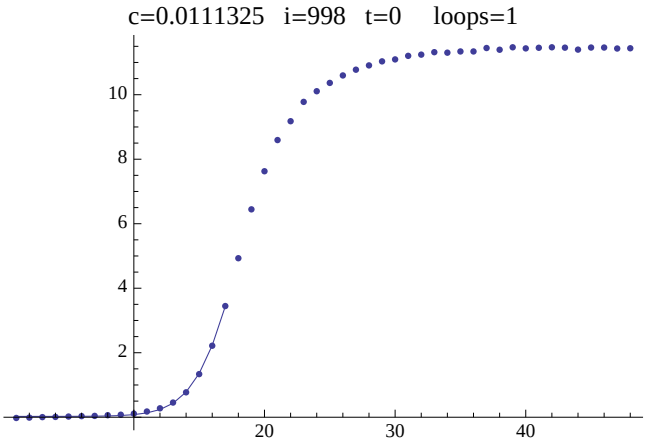
MAK2[F13data]



{d0 → 0.0000930618, k → 0.712197, base → 0.00662347}

{Null}

MAK2[F14data]

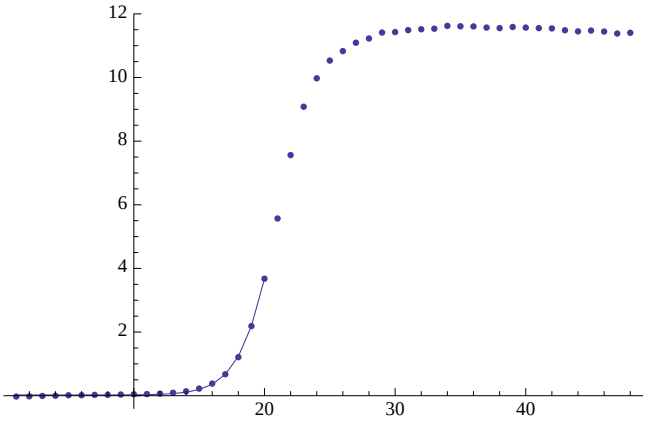


{d0 → 0.0000546615, k → 1.10039, base → 0.0252435}

{Null}

MAK2[F21data]

c=0.0103426 i=5547 t=0 loops=6

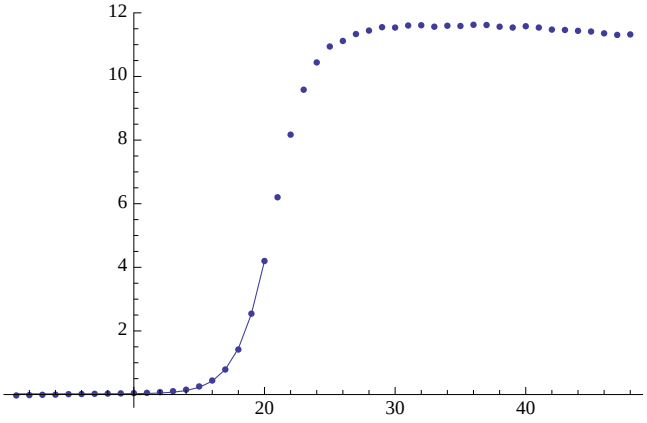


$\{d0 \to 5.34387 \times 10^{-6}, k \to 2.07584, base \to 0.0224431\}$

{Null}

MAK2[F22data]

c=0.0111199 i=1424 t=0 loops=2

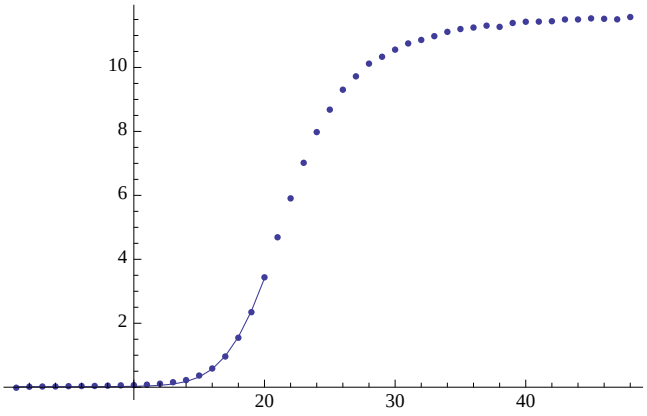


$\{d0 \to 6.39456 \times 10^{-6}, k \to 2.14373, base \to 0.0219707\}$

{Null}

MAK2[F23data]

c=0.0209377 i=5002 t=4 loops=4

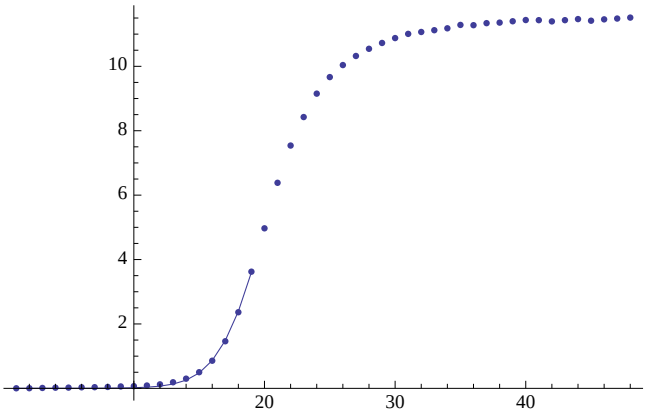



```
{d0 → 0.0000102571, k → 0.686167, base → 0.0175253}
```

```
{Null}
```

MAK2[F24data]

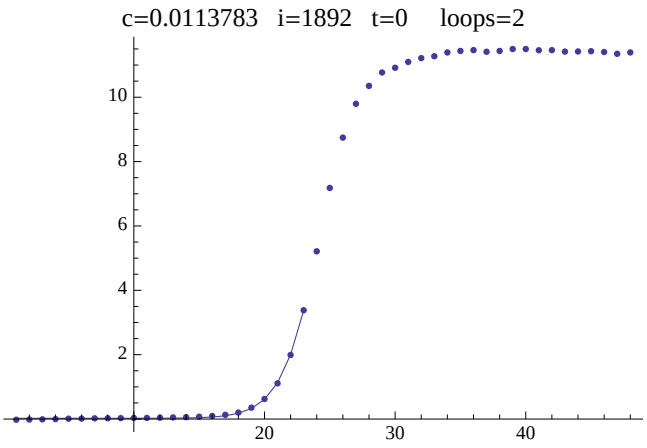
c=0.0220832 i=3096 t=0 loops=3




```
{d0 → 0.0000163518, k → 0.985408, base → 0.00281425}
```

```
{Null}
```

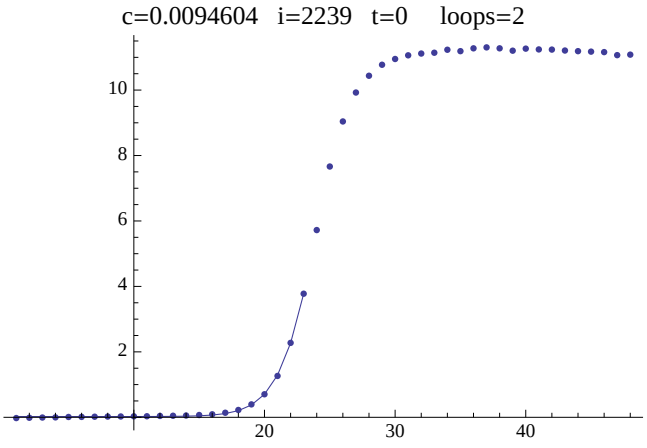
MAK2[F31data]



$\{d0 \to 6.04607 \times 10^{-7}, k \to 1.9737, base \to 0.0232698\}$

{Null}

MAK2[F32data]

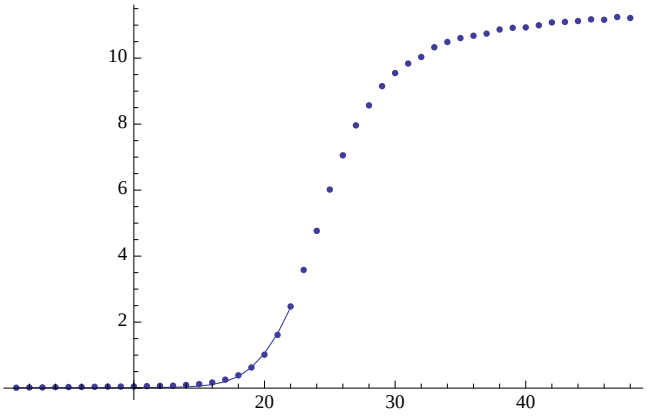


$\{d0 \to 7.06169 \times 10^{-7}, k \to 1.99994, base \to 0.022778\}$

{Null}

MAK2[F33data]

c=0.0311595 i=4027 t=5 loops=4

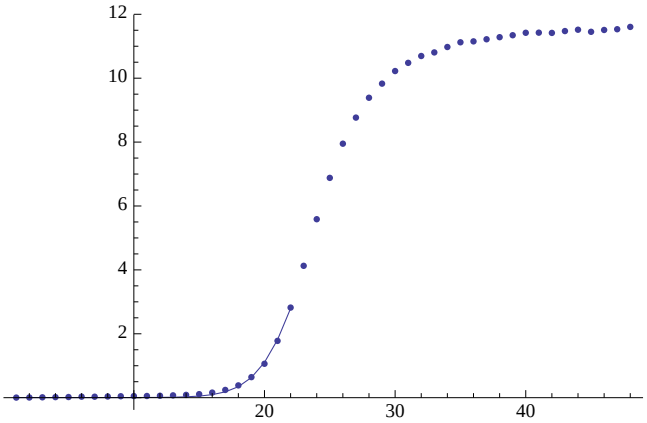


$$\{d0 \to 1.50674 \times 10^{-6},\ k \to 0.601586,\ base \to 0.0134873\}$$

{Null}

MAK2[F34data]

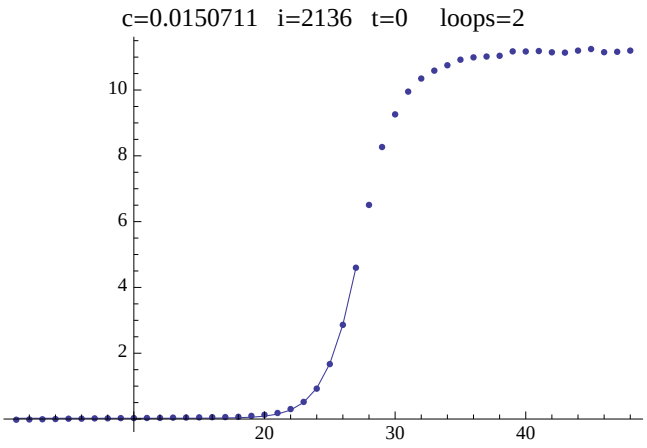
c=0.0358389 i=1955 t=0 loops=2



$$\{d0 \to 1.43264 \times 10^{-6},\ k \to 0.868825,\ base \to 0.00347211\}$$

{Null}

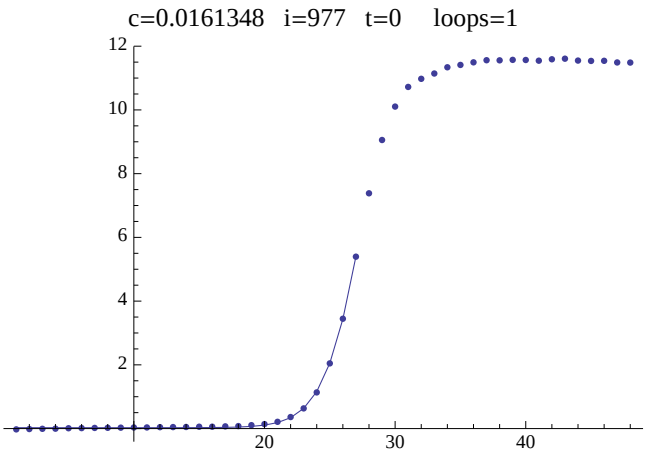
MAK2[F41data]



$\{d0 \to 6.1472 \times 10^{-8}, k \to 1.86829, base \to 0.0232914\}$

{Null}

MAK2[F42data]

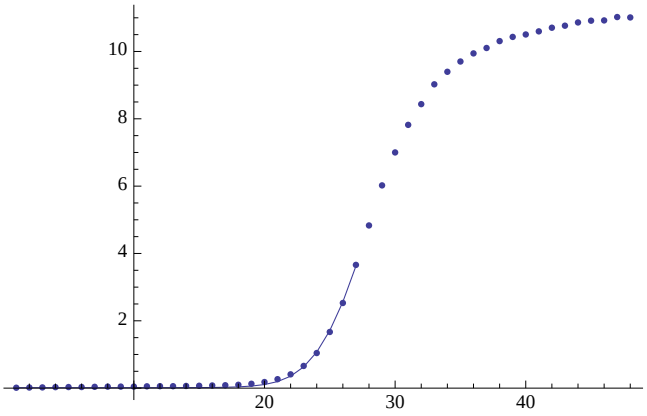


$\{d0 \to 7.80635 \times 10^{-8}, k \to 1.9315, base \to 0.0274261\}$

{Null}

MAK2[F43data]

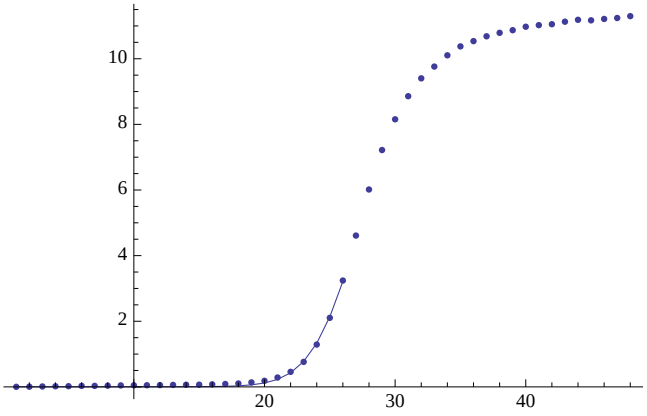
c=0.050553 i=3874 t=0 loops=4



$$\{d0 \to 9.203 \times 10^{-8},\ k \to 0.683405,\ base \to 0.013557\}$$

{Null}

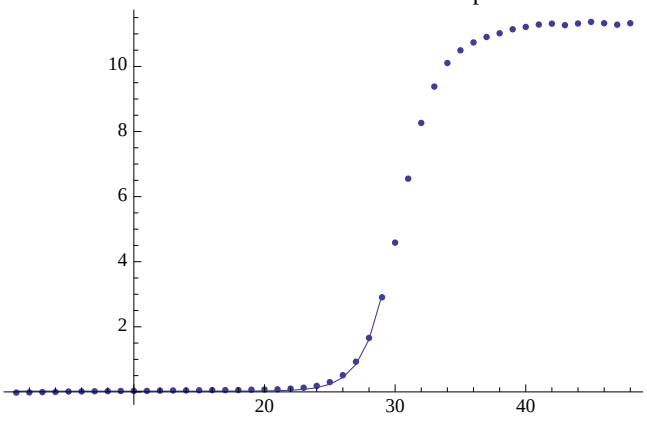
c=0.0556355 i=1265 t=1 loops=1



$$\{d0 \to 1.15039 \times 10^{-7},\ k \to 0.867647,\ base \to 0.00217796\}$$

MAK2[F51data]

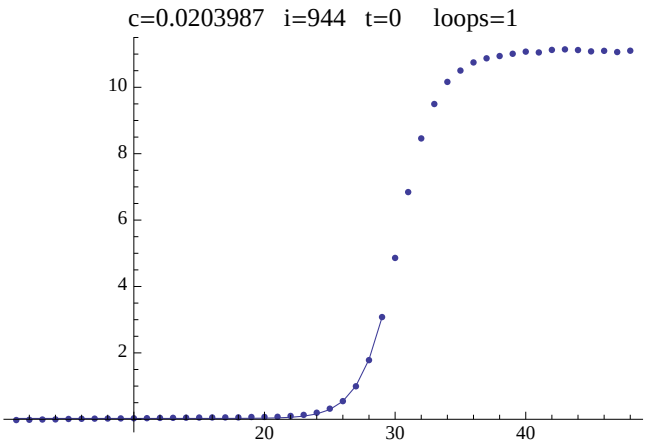
c=0.0477936 i=3168 t=0 loops=4



$$\{d0 \to 6.38367 \times 10^{-9},\ k \to 4.97693,\ base \to 0.0231121\}$$

{Null}

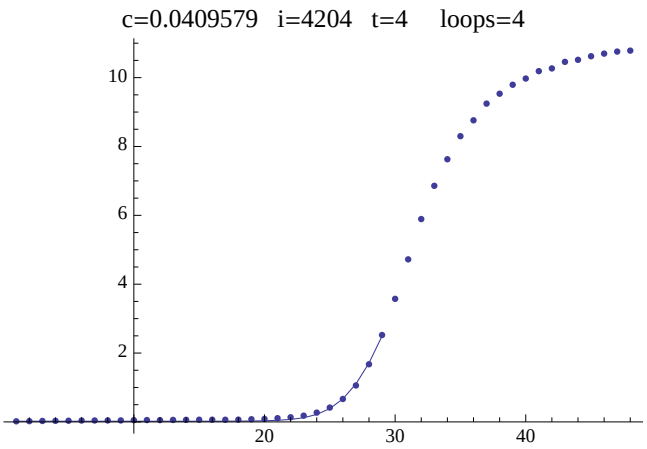
MAK2[F52data]



$\{d0 \to 8.23303 \times 10^{-9}, k \to 1.99813, base \to 0.025555\}$

{Null}

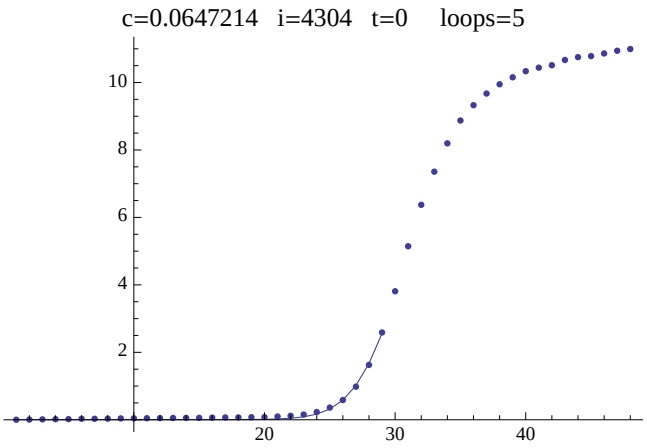
MAK2[F53data]



$\{d0 \to 1.28184 \times 10^{-8}, k \to 0.569539, base \to 0.0192616\}$

{Null}

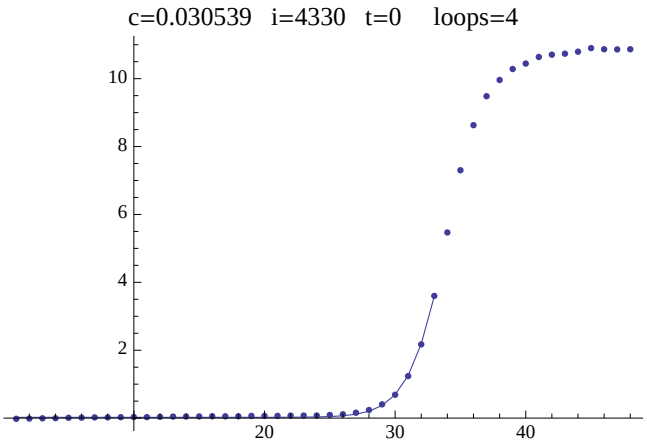
MAK2[F54data]



$\{d0 \to 1.04103 \times 10^{-8}, k \to 0.782183, base \to 0.00188566\}$

{Null}

MAK2[F61data]

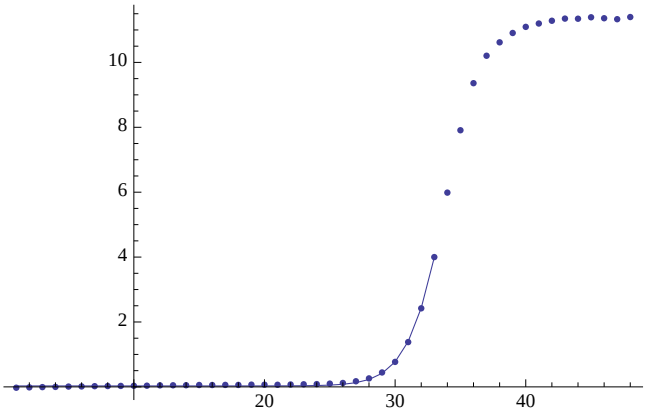


$\{d0 \to 6.85304 \times 10^{-10}, k \to 1.72884, base \to 0.0226451\}$

{Null}

MAK2[F62data]

c=0.0305605 i=1933 t=0 loops=2

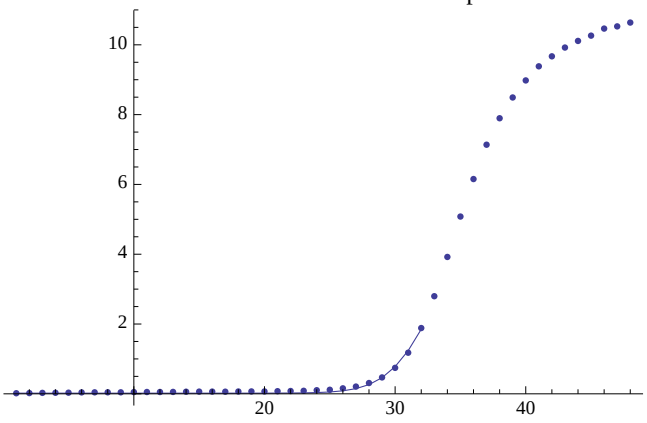


$\{d0 \to 7.61309 \times 10^{-10}, k \to 1.92027, base \to 0.0287448\}$

{Null}

MAK2[F63data]

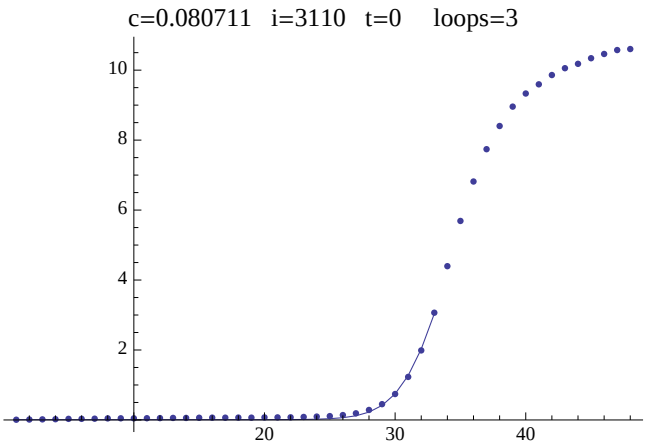
c=0.0569912 i=979 t=0 loops=1



$\{d0 \to 1.03567 \times 10^{-9}, k \to 0.48951, base \to 0.0184934\}$

{Null}

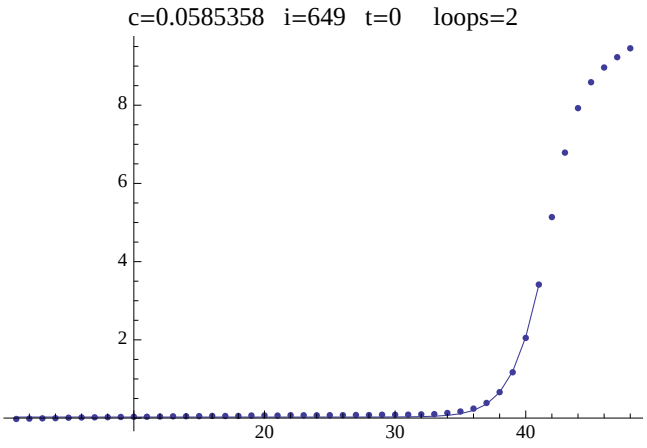
MAK2[F64data]



$$\{d0 \to 8.62968 \times 10^{-10},\ k \to 0.802417,\ base \to 0.00750668\}$$

{Null}

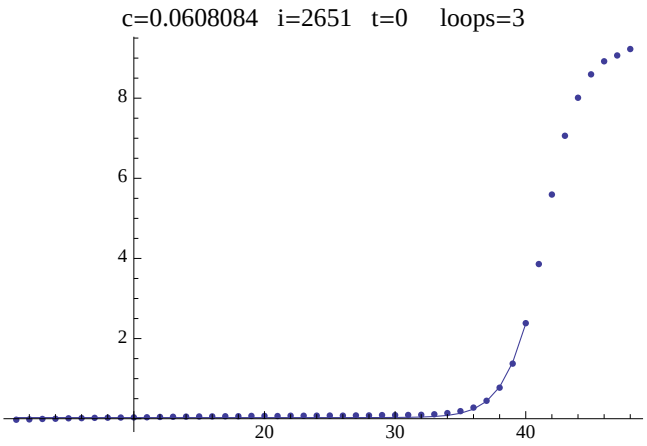
MAK2[F71data]



$$\{d0 \to 2.53156 \times 10^{-12},\ k \to 1.63562,\ base \to 0.0257086\}$$

{Null}

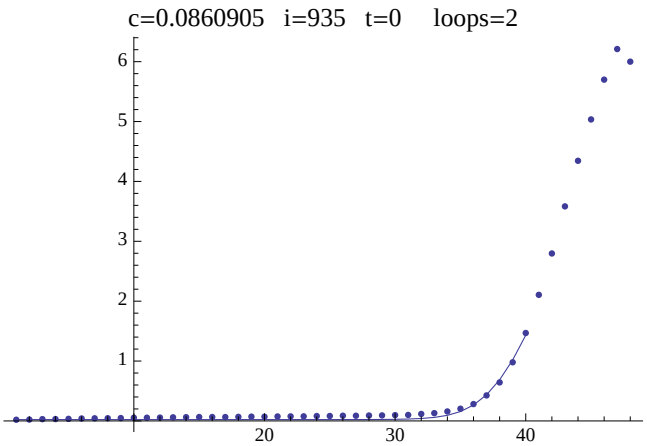
MAK2[F72data]



$\{d0 \to 3.17764 \times 10^{-12}, k \to 1.42958, base \to 0.0279425\}$

{Null}

MAK2[F73data]

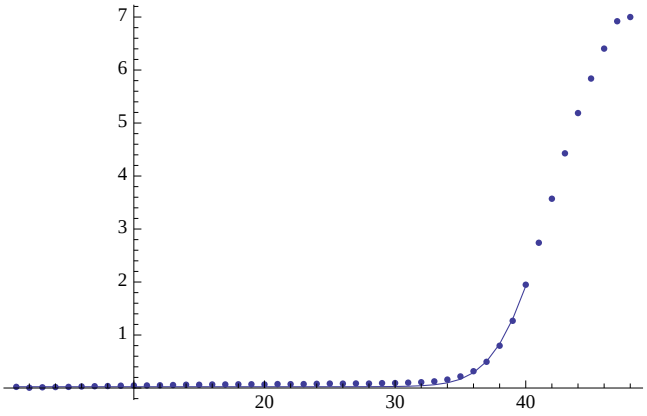


$\{d0 \to 4.43143 \times 10^{-12}, k \to 0.264402, base \to 0.0220891\}$

{Null}

MAK2[F74data]

c=0.0737743 i=1864 t=1 loops=2



$$\{\texttt{d0} \to 4.44709 \times 10^{-12},\ \texttt{k} \to 0.474396,\ \texttt{base} \to 0.0240224\}$$

{Null}