

## **Appendix B: NSDIR and NEC Data Analysis**

```
In[1]:= (* load some packages *)
```

```
In[4]:= << Statistics'DataManipulation'
<< Statistics'NonlinearFit'
<< Statistics'LinearRegression'
```

```
In[7]:= edata = {{0, 0}, {27, 665}, {29, 1649}, {30, 1205}, {60, 2849}, {88,
3591}, {90, 3890}, {91, 770}, {121, 4361}, {122, 272}, {152, 5327},
{173, 0}, {176, 2800}, {180, 5842}, {182, 1537}, {183, 812}, {202,
252}, {211, 25395}, {213, 1947}, {229, 363}, {244, 2725}, {247,
30489}, {272, 3322}, {275, 3126}, {295, 6500}, {303, 3973}, {321,
691}, {333, 4643}, {334, 4457}, {358, 835}, {364, 5268}, {387, 53853},
{394, 5915}, {395, 6029}, {419, 1360}, {425, 6857}, {430, 19665},
{456, 64655}, {487, 77060}, {511, 279763}, {532, 92290}, {590,
111531}, {665, 43324}, {681, 129263}, {682, 139257}, {701, 139257},
{713, 147987}, {738, 147987}, {817, 191813}, {897, 244215}, {924,
244215}, {938, 259490}, {987, 300921}, {999, 300921}, {1023, 315627}}
```

```
Out[7]= {{0, 0}, {27, 665}, {29, 1649}, {30, 1205}, {60, 2849}, {88, 3591}, {90, 3890}, {91, 770},
{121, 4361}, {122, 272}, {152, 5327}, {173, 0}, {176, 2800}, {180, 5842}, {182, 1537},
{183, 812}, {202, 252}, {211, 25395}, {213, 1947}, {229, 363}, {244, 2725}, {247, 30489},
{272, 3322}, {275, 3126}, {295, 6500}, {303, 3973}, {321, 691}, {333, 4643}, {334, 4457},
{358, 835}, {364, 5268}, {387, 53853}, {394, 5915}, {395, 6029}, {419, 1360},
{425, 6857}, {430, 19665}, {456, 64655}, {487, 77060}, {511, 279763}, {532, 92290},
{590, 111531}, {665, 43324}, {681, 129263}, {682, 139257}, {701, 139257},
{713, 147987}, {738, 147987}, {817, 191813}, {897, 244215}, {924, 244215},
{938, 259490}, {987, 300921}, {999, 300921}, {1023, 315627}}
```

```
In[8]:= (* mtlin is the linear model *)
mtlin = 2 K a t Exp[-a t^2]
```

```
Out[8]= 2 a E^{-a t^2} K t
```

```
In[30]:= NonlinearFit[edata, mtlin, t, {{K, -10^-6}, {a, -10^-6}}, MaxIterations -> 3000,
PrecisionGoal -> 1, AccuracyGoal -> 1]
```

```
In[36]:= mts = -(-a + 2 a Exp[c t] / (1 + Exp[2 c t])) Exp[-a t + 2 a / c (ArcTan[Exp[c t]] - 0.78)]
```

```
Out[36]= E^{-a t + \frac{2 a (-0.78 + \text{ArcTan}[e^{c t}])}{c}} \left( a - \frac{2 a E^{c t}}{1 + E^{2 c t}} \right)
```

```
In[48]:= mts2 = .74 10^10 mts /. {a -> .00047, c -> .000422}
```

```
Out[48]= 7.4 \times 10^9 E^{-0.00047 t + 2.22749 (-0.78 + \text{ArcTan}[e^{0.000422 t}])} \left( 0.00047 - \frac{0.00094 E^{0.000422 t}}{1 + E^{0.000844 t}} \right)
```

```
In[35]:= col2 = Column[edata, 2] (* actual data i.e. y-axis is now in col2 list *)
```

```
Out[35]= {0, 665, 1649, 1205, 2849, 3591, 3890, 770, 4361, 272, 5327, 0, 2800, 5842, 1537, 812, 252,
25395, 1947, 363, 2725, 30489, 3322, 3126, 6500, 3973, 691, 4643, 4457, 835, 5268, 53853,
5915, 6029, 1360, 6857, 19665, 64655, 77060, 279763, 92290, 111531, 43324, 129263,
139257, 139257, 147987, 147987, 191813, 244215, 244215, 259490, 300921, 300921, 315627}
```

```
In[44]:= col1 = Column[edata, 1]
dmts2 = mts2 /. t -> col1
```

```
Out[44]= {0, 27, 29, 30, 60, 88, 90, 91, 121, 122, 152, 173, 176, 180, 182, 183, 202, 211, 213, 229,
244, 247, 272, 275, 295, 303, 321, 333, 334, 358, 364, 387, 394, 395, 419, 425, 430,
456, 487, 511, 532, 590, 665, 681, 682, 701, 713, 738, 817, 897, 924, 938, 987, 999, 1023}
```

```
In[414]:= mts2 = .74 10^10 mts /. {a -> .00047, c -> .000422}
newcol2 = mts2 /. t -> col1
err = Sqrt[Plus@@((newcol2 - col2)^2)]
```

```
Out[414]=  $7.4 \times 10^9 E^{-0.00047 t + 2.22749 (-0.78 + \text{ArcTan}[E^{0.000422 t}])} \left( 0.00047 - \frac{0.00094 E^{0.000422 t}}{1 + E^{0.000844 t}} \right)$ 
```

```
Out[415]= {0., 228.481, 263.582, 282.072, 1128.06, 2425.82, 2537.27, 2593.93, 4583.9, 4659.89,
7228.84, 9359.31, 9685.94, 10130.1, 10355.9, 10469.7, 12749.3, 13906.6, 14170.6,
16370.4, 18574.8, 19032.1, 23056.1, 23564.4, 27091.9, 28570.3, 32036.8, 34455.1,
34660.4, 39767.2, 41096.9, 46389.4, 48061.3, 48302.5, 54263.7, 55805.8, 57106.5,
64099.6, 72934.4, 80140.3, 86703.9, 106058., 133663., 139914., 140309., 147902.,
152786., 163177., 197862., 235662., 248983., 255995., 281084., 287352., 300028.}
```

```
Out[416]= 261856.
```

```
In[425]:= mtlin2 = mtlin /. {K -> -100}
NonlinearFit[edata, mtlin2, t, {{a, 0.00}}, MaxIterations -> 300,
PrecisionGoal -> 1, AccuracyGoal -> 1]
```

```
Out[425]=  $-200 a E^{-a t^2} t$ 
```

```
Out[426]=  $0. E^{0. t^2} t$ 
```

```
In[141]:= mta =  
          -K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]  
Out[141]= -E-0.7854-1.8 c t+3.6 ArcTan[Ec t]  $\left(-1.8 c + \frac{3.6 c E^{c t}}{1 + E^{2 c t}}\right) K$   
  
In[142]:= edata = {{100, 49181}, {200, 108250}, {300, 195735}, {400, 156126}, {500, 0}}  
          col1 = Column[edata, 1]  
          col2 = Column[edata, 2]  
Out[142]= {{100, 49181}, {200, 108250}, {300, 195735}, {400, 156126}, {500, 0}}  
Out[143]= {100, 200, 300, 400, 500}  
Out[144]= {49181, 108250, 195735, 156126, 0}
```

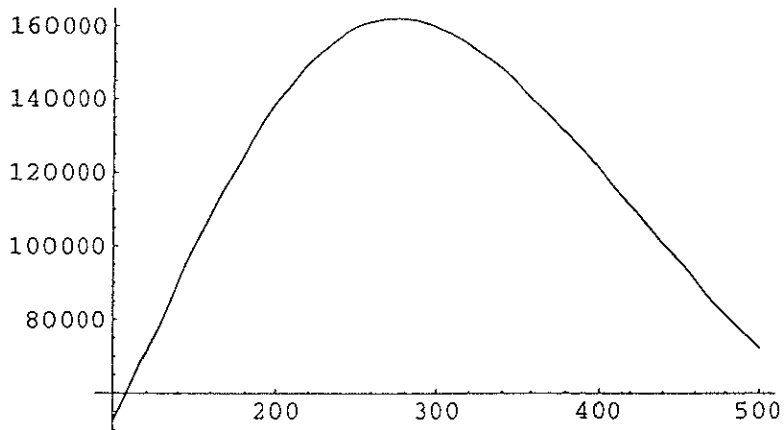
```
In[247]:= ft = NonlinearFit[edata, mta, t, {{K, 3 10^6}, {c, 5.0 10^-3}}, MaxIterations -> 100,
  PrecisionGoal -> 1, AccuracyGoal -> 1]
  dmta = ft /. t -> col1
  err = dmta - col2
  rms = Sqrt[Plus@@((dmta - col2)^2)]
  Plot[ft, {t, 100, 500}]
  ListPlot[edata]
```

```
Out[247]= -7.99247 × 106 E-0.7854-0.00854139 t+3.6 ArcTan[E0.00474522 t]  $\left( -0.00854139 + \frac{0.0170828 E^{0.00474522 t}}{1 + E^{0.00949044 t}} \right)$ 
```

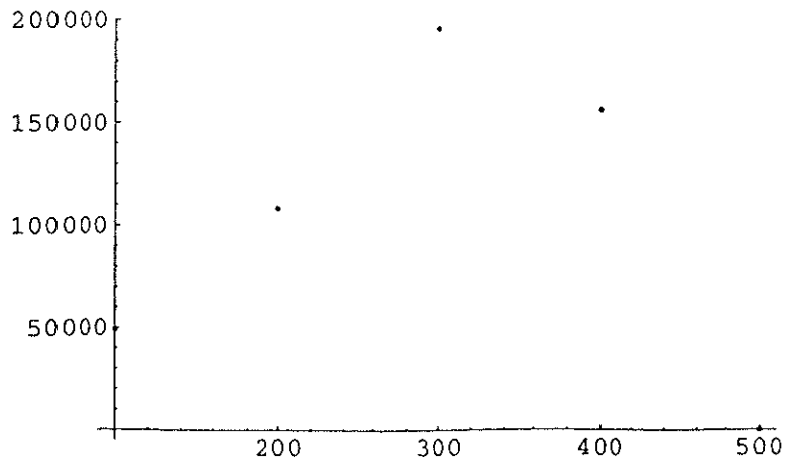
```
Out[248]= {52519.5, 139238., 159508., 120776., 72465.}
```

```
Out[249]= {3338.52, 30988.3, -36227.2, -35350.3, 72465.}
```

```
Out[250]= 93726.4
```



```
Out[251]= - Graphics -
```



```
Out[252]= - Graphics -
```

In[141]:= mta =  
-K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]

Out[141]=  $-E^{-0.7854-1.8ct+3.6\text{ArcTan}[E^{ct}]} \left( -1.8c + \frac{3.6cE^{ct}}{1+E^{2ct}} \right) K$

In[253]:= edata = {{100, 16507}, {200, 42787}, {300, 84383}, {400, 55426}, {500, 967}}  
col1 = Column[edata, 1]  
col2 = Column[edata, 2]

Out[253]= {{100, 16507}, {200, 42787}, {300, 84383}, {400, 55426}, {500, 967}}

Out[254]= {100, 200, 300, 400, 500}

Out[255]= {16507, 42787, 84383, 55426, 967}

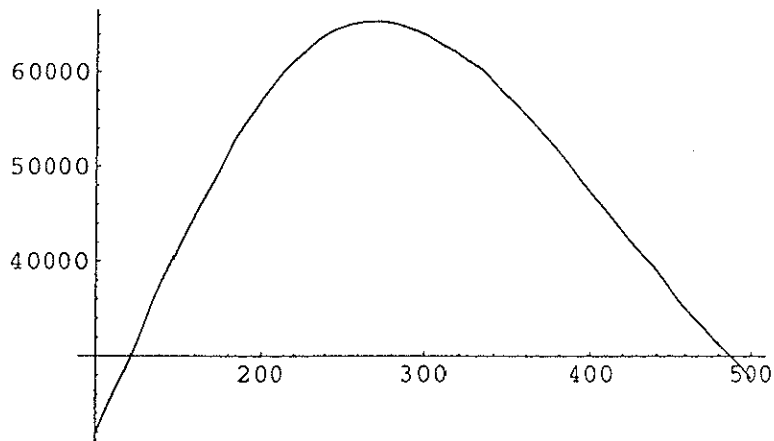
```
In[256]:= ft = NonlinearFit[edata, mta, t, {{K, 2 10^6}, {c, 5.0 10^-3}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmta = ft /. t -> col1
err = dmta - col2
rms = Sqrt[Plus@@((dmta - col2)^2)]
Plot[ft, {t, 100, 500}]
ListPlot[edata]
```

```
Out[256]= -3.17024×106 E-0.7854-0.00870407 t+3.6 ArcTan[E0.00483559 t]  $\left(-0.00870407 + \frac{0.0174081 E^{0.00483559 t}}{1 + E^{0.00967119 t}}\right)$ 
```

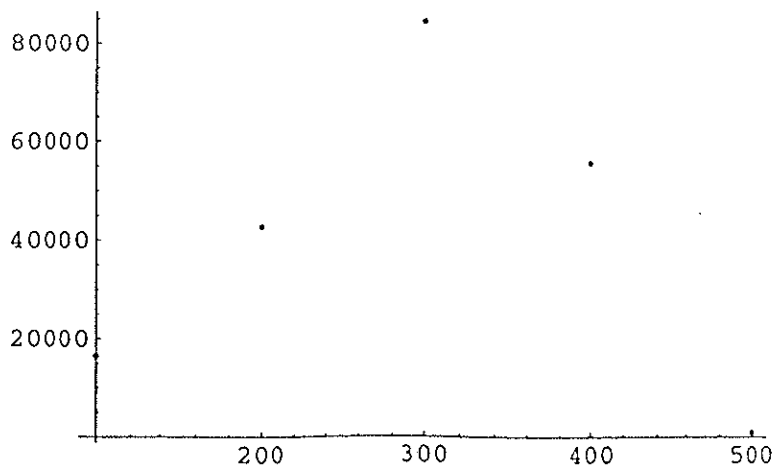
```
Out[257]= {21935., 57209.8, 64021.4, 47266.3, 27673.}
```

```
Out[258]= {5427.97, 14422.8, -20361.6, -8159.68, 26706.}
```

```
Out[259]= 37840.
```



```
Out[260]= - Graphics -
```



```
Out[261]= - Graphics -
```

```
In[4]:= mta =  
      -K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]
```

```
Out[4]= -E-0.7854-1.8 c t+3.6 ArcTan[Ec t]  $\left(-1.8 c + \frac{3.6 c E^{c t}}{1 + E^{2 c t}}\right) K$ 
```

```
In[5]:= edata = {{100, 314}, {200, 476}, {300, 666}, {400, 877}, {500, 173}}  
      col1 = Column[edata, 1]  
      col2 = Column[edata, 2]
```

```
Out[5]= {{100, 314}, {200, 476}, {300, 666}, {400, 877}, {500, 173}}
```

```
Out[6]= {100, 200, 300, 400, 500}
```

```
Out[7]= {314, 476, 666, 877, 173}
```



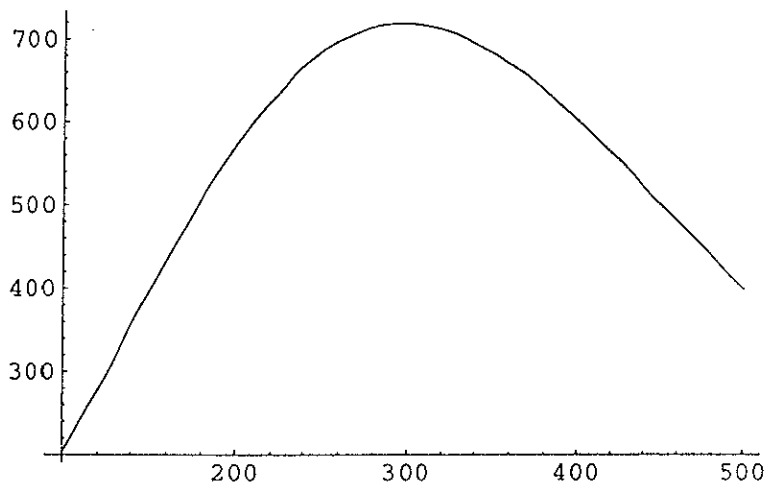
```
In[56]:= ft = NonlinearFit[edata, mta, t, {{K, 3 10^7}, {c, 9 10^-6}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmta = ft /. t -> col1
err = dmta - col2
rms = Sqrt[Plus@@((dmta - col2)^2)]
Plot[ft, {t, 100, 500}]
ListPlot[edata]
```

Out[56]=  $-38544.6 E^{-0.7854-0.00789202 t+3.6 \text{ArcTan}[E^{0.00438445 t}]} \left( -0.00789202 + \frac{0.015784 E^{0.00438445 t}}{1 + E^{0.00876891 t}} \right)$

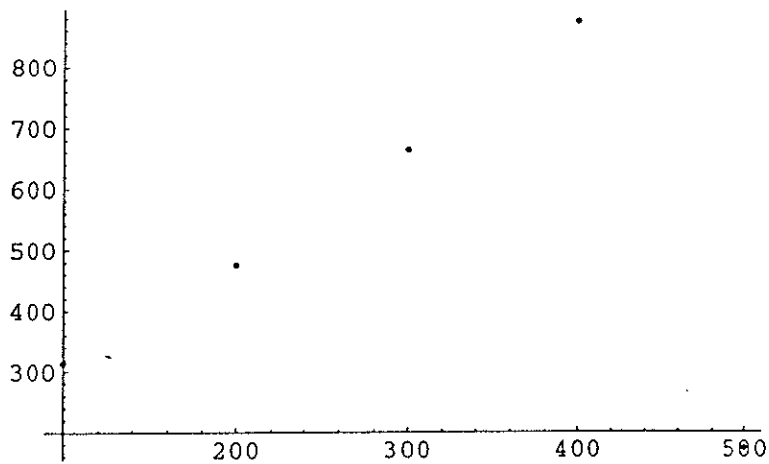
Out[57]= {203.606, 574.598, 721.287, 603.957, 400.042}

Out[58]= {-110.394, 98.5975, 55.2872, -273.043, 227.042}

Out[59]= 388.672



Out[60]= - Graphics -



Out[61]= - Graphics -

```
In[4]:= mta =  
      -K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]
```

```
Out[4]= -E-0.7854-1.8 ct+3.6 ArcTan[Ect]  $\left(-1.8 c + \frac{3.6 c E^{ct}}{1 + E^{2 ct}}\right) K$ 
```

```
In[62]:= edata = {{100, 480}, {200, 636}, {300, 1000}, {400, 500}, {500, 145}}  
      col1 = Column[edata, 1]  
      col2 = Column[edata, 2]
```

```
Out[62]= {{100, 480}, {200, 636}, {300, 1000}, {400, 500}, {500, 145}}
```

```
Out[63]= {100, 200, 300, 400, 500}
```

```
Out[64]= {480, 636, 1000, 500, 145}
```

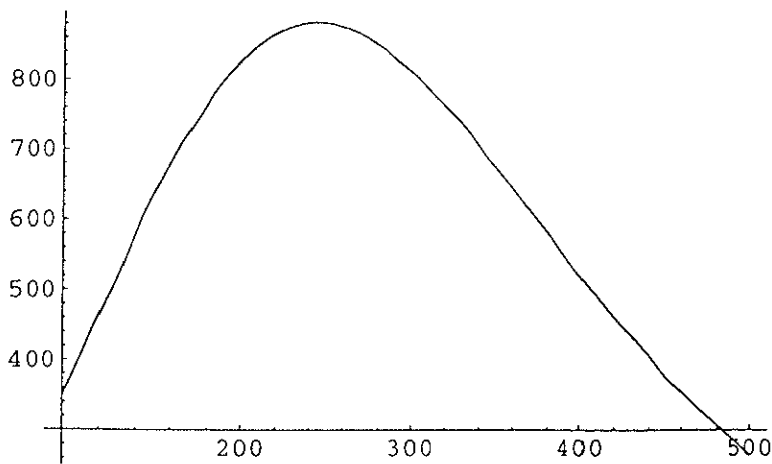
```
In[71]:= ft = NonlinearFit[edata, mta, t, {{K, 3.9 10^6}, {c, 1.6 10^-2}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmta = ft /. t -> col1
err = dmta - col2
rms = Sqrt[Plus@@((dmta - col2)^2)]
Plot[ft, {t, 100, 500}]
ListPlot[edata]
```

Out [71]=  $-38571.1 E^{-0.7854-0.00961829 t+3.6 \text{ArcTan}[E^{0.0053435 t}]} \left( -0.00961829 + \frac{0.0192366 E^{0.0053435 t}}{1 + E^{0.010687 t}} \right)$

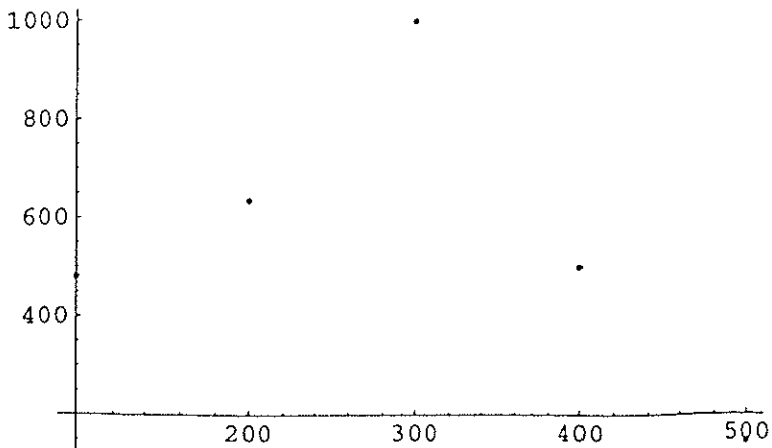
Out [72]= {349.388, 827.117, 809.064, 518.404, 265.064}

Out [73]= {-130.612, 191.117, -190.936, 18.4035, 120.064}

Out [74]= 323.722



Out [75]= - Graphics -



Out [76]= - Graphics -

```
In[631]:= mta =  
          -K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]
```

```
Out[631]= -E-0.7854-1.8 c t+3.6 ArcTan[Ec t]  $\left(-1.8 c + \frac{3.6 c E^{c t}}{1 + E^{2 c t}}\right) K$ 
```

```
In[632]:= edata = {{100, 213}, {200, 263}, {300, 885}, {400, 182}, {500, 60}}  
          col1 = Column[edata, 1]  
          col2 = Column[edata, 2]
```

```
Out[632]= {{100, 213}, {200, 263}, {300, 885}, {400, 182}, {500, 60}}
```

```
Out[633]= {100, 200, 300, 400, 500}
```

```
Out[634]= {213, 263, 885, 182, 60}
```

```
In[4]:= mta =  
-K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]
```

```
Out[4]= -E-0.7854-1.8 c t+3.6 ArcTan[Ec t]  $\left(-1.8 c + \frac{3.6 c E^{c t}}{1 + E^{2 c t}}\right) K$ 
```

```
In[77]:= edata = {{100, 1330}, {200, 1730}, {300, 2580}, {400, 1350}, {500, 300}}  
col1 = Column[edata, 1]  
col2 = Column[edata, 2]
```

```
Out[77]= {{100, 1330}, {200, 1730}, {300, 2580}, {400, 1350}, {500, 300}}
```

```
Out[78]= {100, 200, 300, 400, 500}
```

```
Out[79]= {1330, 1730, 2580, 1350, 300}
```

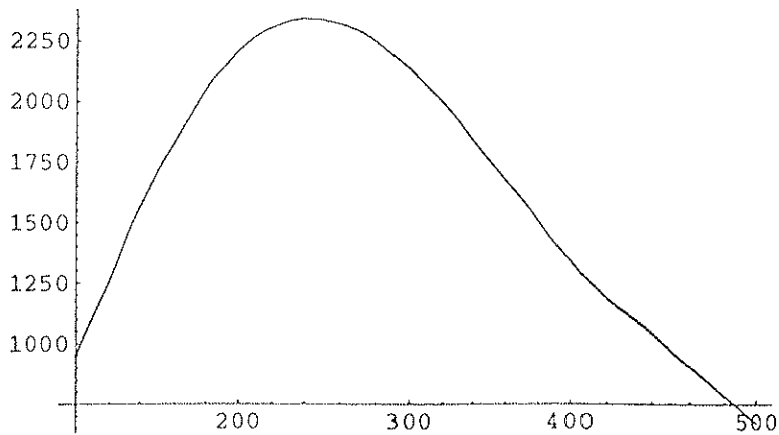
```
In[140]:= ft = NonlinearFit[edata, mta, t, {{K, 3 10^6}, {c, 110^-2}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmta = ft /. t -> col1
err = dmta - col2
rms = Sqrt[Plus@@((dmta - col2)^2)]
Plot[ft, {t, 100, 500}]
ListPlot[edata]
```

Out[140]=  $-101323. E^{-0.7854-0.00974122 t+3.6 \text{ArcTan}[E^{0.00541179 t}]} \left( -0.00974122 + \frac{0.0194824 E^{0.00541179 t}}{1 + E^{0.0108236 t}} \right)$

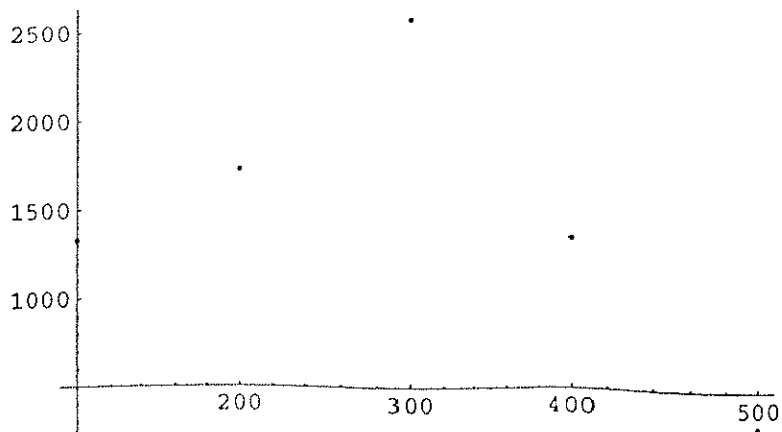
Out[141]= {949.333, 2216.95, 2128.99, 1338.5, 672.246}

Out[142]= {-380.667, 486.945, -451.013, -11.4981, 372.246}

Out[143]= 850.961



Out[144]= - Graphics -



Out[145]= - Graphics -

```
In[631]:= mta =  
          -K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]
```

```
Out[631]= -E-0.7854-1.8 c t+3.6 ArcTan[Ec t]  $\left(-1.8 c + \frac{3.6 c E^{c t}}{1 + E^{2 c t}}\right) K$ 
```

```
In[641]:= edata = {{100, 833}, {200, 1053}, {300, 1587}, {400, 787}, {500, 0}}  
          col1 = Column[edata, 1]  
          col2 = Column[edata, 2]
```

```
Out[641]= {{100, 833}, {200, 1053}, {300, 1587}, {400, 787}, {500, 0}}
```

```
Out[642]= {100, 200, 300, 400, 500}
```

```
Out[643]= {833, 1053, 1587, 787, 0}
```

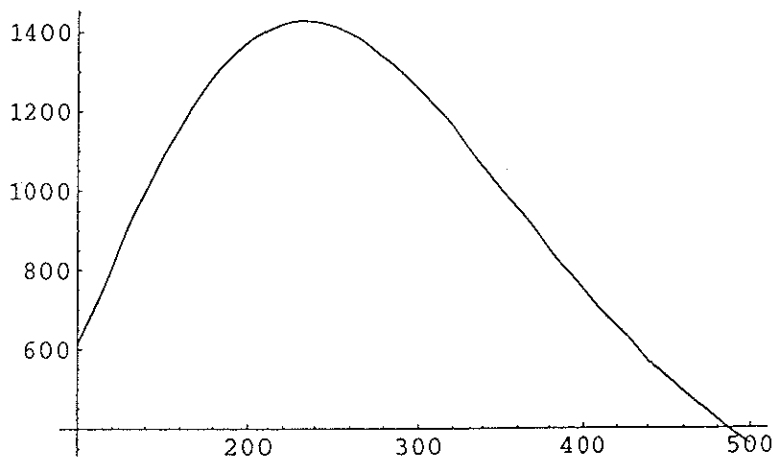
```
In[644]:= ft = NonlinearFit[edata, mta, t, {{K, 2 10^6}, {c, 1 10^-2}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmta = ft /. t -> col1
err = dmta - col2
rms = Sqrt[Plus@@((dmta - col2)^2)]
Plot[ft, {t, 100, 500}]
ListPlot[edata]
```

Out[644]=  $-59773.3 E^{-0.7854-0.0100712 t+3.6 \text{ArcTan}[E^{0.00559512 t}]} \left( -0.0100712 + \frac{0.0201424 E^{0.00559512 t}}{1 + E^{0.0111902 t}} \right)$

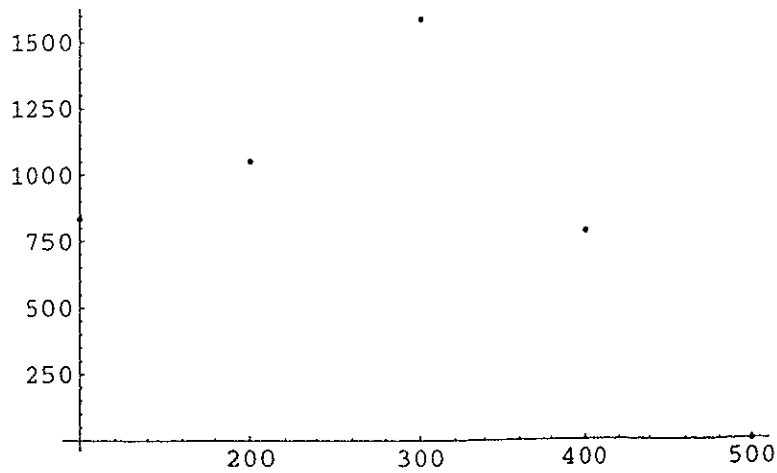
Out[645]= {611.558, 1375.88, 1257.19, 751.269, 359.753}

Out[646]= {-221.442, 322.88, -329.812, -35.7312, 359.753}

Out[647]= 626.708



Out[648]= - Graphics -



Out[649]= - Graphics -



```
In[631] := mta =  
-K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]
```

```
Out[631] = -E-0.7854-1.8 c t+3.6 ArcTan[Ec t]  $\left(-1.8 c + \frac{3.6 c E^{c t}}{1 + E^{2 c t}}\right) K$ 
```

```
In[650] := edata = {{100, 30}, {200, 30}, {300, 40}, {400, 35}, {500, 221}}  
col1 = Column[edata, 1]  
col2 = Column[edata, 2]
```

```
Out[650] = {{100, 30}, {200, 30}, {300, 40}, {400, 35}, {500, 221}}
```

```
Out[651] = {100, 200, 300, 400, 500}
```

```
Out[652] = {30, 30, 40, 35, 221}
```

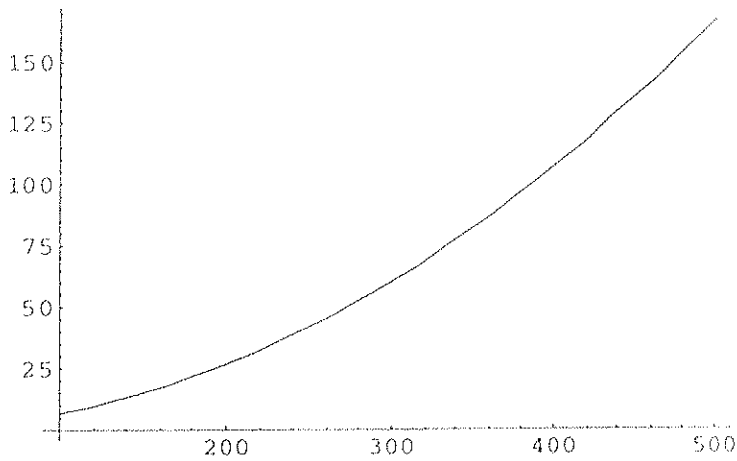
```
In[653]:= ft = NonlinearFit[edata, mta, t, {{K, 1 10^8}, {c, 1 10^-4}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmta = ft /. t -> col1
err = data - col2
rms = Sqrt[Plus@@((dmta - col2)^2)]
Plot[ft, {t, 100, 500}]
ListPlot[edata]
```

Out[653]=  $-1. \times 10^8 E^{-0.7854-0.000178305 t+3.6 \text{ArcTan}[E^{0.0000990581 t}]} \left( -0.000178305 + \frac{0.000356609 E^{0.0000990581 t}}{1 + E^{0.000198116 t}} \right)$

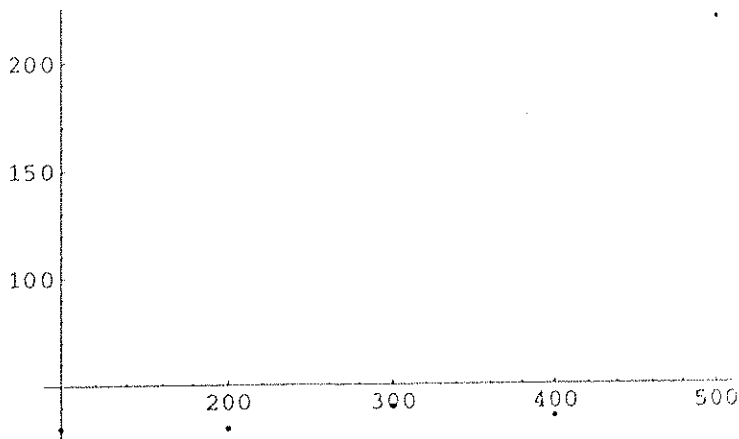
Out[654]= {6.74122, 26.9615, 60.6507, 107.791, 168.359}

Out[655]= {-23.2588, -3.03847, 20.6507, 72.7915, -52.6407}

Out[656]= 95.112



Out[657]= - Graphics -



Out[658]= - Graphics -

```
In[631]:= mta =  
          -K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]
```

```
Out[631]= -E-0.7854-1.8 c t+3.6 ArcTan[Ec t]  $\left(-1.8 c + \frac{3.6 c E^{c t}}{1 + E^{2 c t}}\right) K$ .
```

```
In[659]:= edata = {{100, 6004}, {200, 7674}, {300, 18879}, {400, 6022}, {500, 5}}  
          col1 = Column[edata, 1]  
          col2 = Column[edata, 2]
```

```
Out[659]= {{100, 6004}, {200, 7674}, {300, 18879}, {400, 6022}, {500, 5}}
```

```
Out[660]= {100, 200, 300, 400, 500}
```

```
Out[661]= {6004, 7674, 18879, 6022, 5}
```

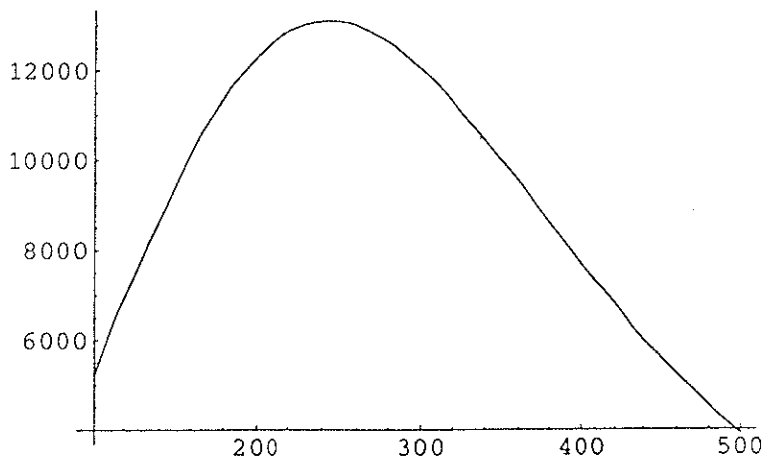
```
In[662]:= ft = NonlinearFit[edata, mta, t, {{K, 1.5 10^6}, {c, 6 10^-3}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmta = ft /. t -> col1
err = dmta - col2
rms = Sqrt[Plus@@((dmta - col2)^2)]
Plot[ft, {t, 100, 500}]
ListPlot[edata]
```

Out[662]=  $-573875. E^{-0.7854-0.00963812 t+3.6 \text{ArcTan}[E^{0.00535451 t}]} \left( -0.00963812 + \frac{0.0192762 E^{0.00535451 t}}{1 + E^{0.010709 t}} \right)$

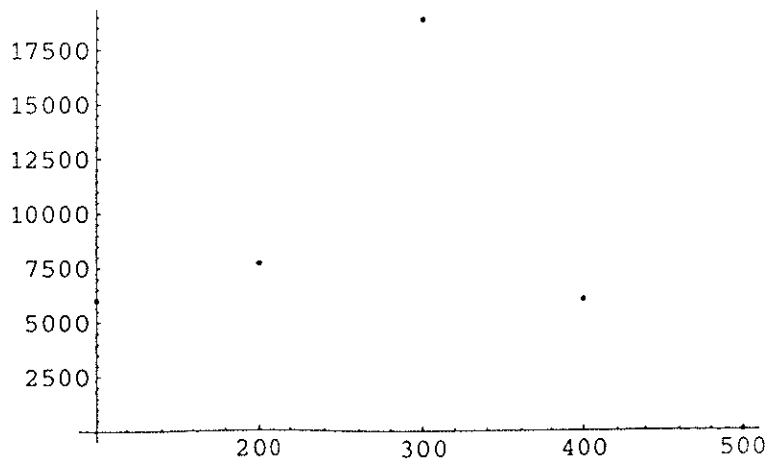
Out[663]= {5226.91, 12346.8, 12041.5, 7691.94, 3921.59}

Out[664]= {-777.089, 4672.76, -6837.5, 1669.94, 3916.59}

Out[665]= 9344.43



Out[666]= - Graphics -



Out[667]= - Graphics -

```
In[4]:= mta =  
      -K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]
```

```
Out[4]= -E-0.7854-1.8 c t+3.6 ArcTan[Ec t]  $\left(-1.8 c + \frac{3.6 c E^{c t}}{1 + E^{2 c t}}\right) K$ 
```

```
In[146]:= edata = {{100, 172}, {200, 234}, {300, 352}, {400, 164}, {500, 1573}}  
      col1 = Column[edata, 1]  
      col2 = Column[edata, 2]
```

```
Out[146]= {{100, 172}, {200, 234}, {300, 352}, {400, 164}, {500, 1573}}
```

```
Out[147]= {100, 200, 300, 400, 500}
```

```
Out[148]= {172, 234, 352, 164, 1573}
```

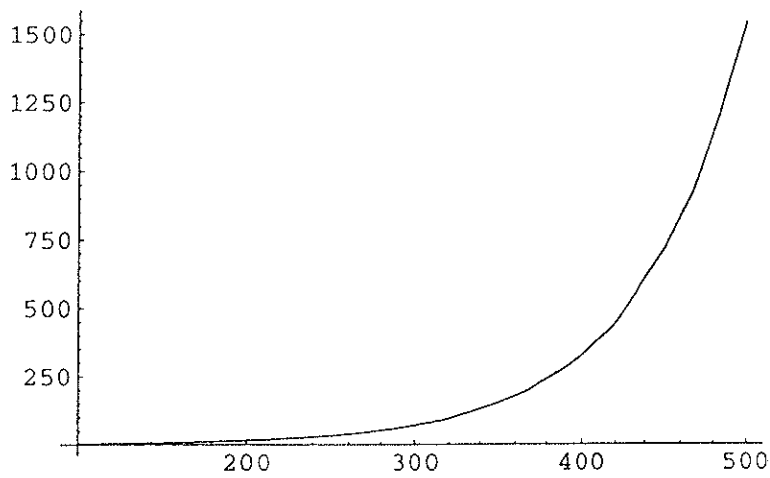
```
In[347]:= ft = NonlinearFit[edata, mta, t, {{K, 1.610^6}, {c, 9.9910^-2}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmta = ft /. t -> col1
err = dmta - col2
rms = Sqrt[Plus@@((dmta - col2)^2)]
Plot[ft, {t, 100, 500}]
ListPlot[edata]
```

Out[347]=  $76.0682 E^{-0.7854+0.0158481 t+3.6 \text{ArcTan}[E^{-0.0088045 t}]} \left( 0.0158481 - \frac{0.0316962 E^{-0.0088045 t}}{1 + E^{-0.017609 t}} \right)$

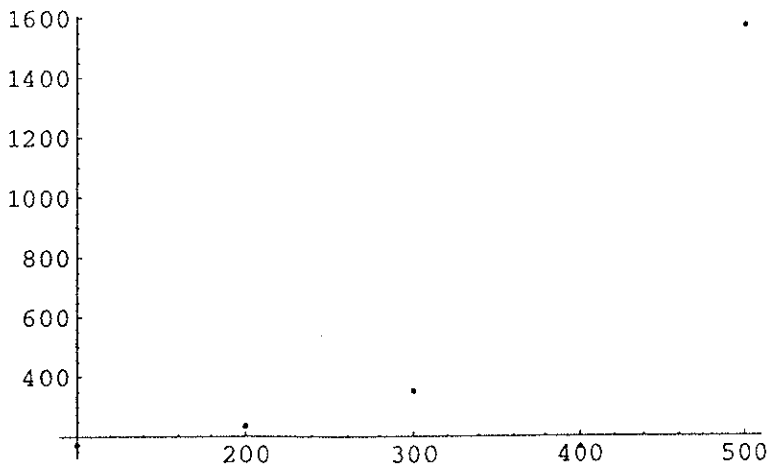
Out[348]= {3.22748, 16.0807, 70.7494, 325.786, 1548.23}

Out[349]= {-168.773, -217.919, -281.251, 161.786, -24.7717}

Out[350]= 426.454



Out[351]= - Graphics -



Out[352]= - Graphics -

```
In[4]:= mta =  
      -K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]
```

```
Out[4]= -E-0.7854-1.8 c t+3.6 ArcTan[Ec t]  $\left(-1.8 c + \frac{3.6 c E^{c t}}{1 + E^{2 c t}}\right) K$ 
```

```
In[353]:= edata = {{100, 975}, {200, 535}, {300, 511}, {400, 534}, {500, 5330}}  
      col1 = Column[edata, 1]  
      col2 = Column[edata, 2]
```

```
Out[353]= {{100, 975}, {200, 535}, {300, 511}, {400, 534}, {500, 5330}}
```

```
Out[354]= {100, 200, 300, 400, 500}
```

```
Out[355]= {975, 535, 511, 534, 5330}
```

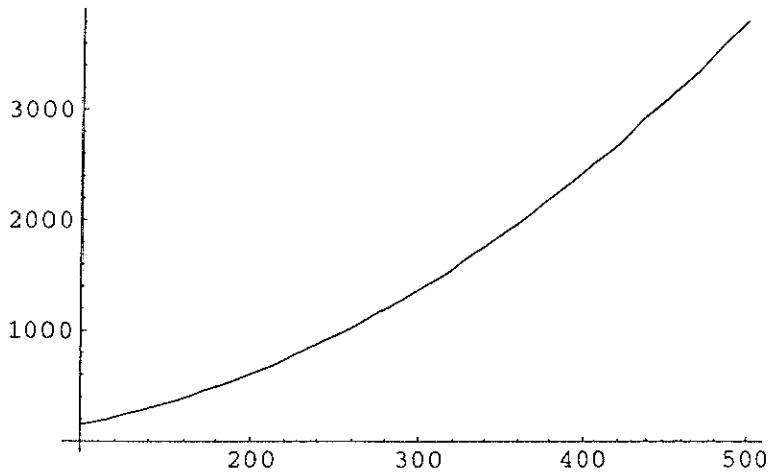
```
In[356]:= ft = NonlinearFit[edata, mta, t, {{K, 2.9 10^12}, {c, 1.110^-5}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmta = ft /. t -> col1
err = dmta - col2
rms = Sqrt[Plus@@((dmta - col2)^2)]
Plot[ft, {t, 100, 500}]
ListPlot[edata]
```

$$\text{Out[356]} = -2.9 \times 10^{12} E^{-0.7854 - 0.0000164213 t + 3.6 \text{ArcTan}[E^{9.12292 \times 10^{-6} t}]} \left( -0.0000164213 + \frac{0.0000328425 E^{9.12292 \times 10^{-6} t}}{1 + E^{0.0000182458 t}} \right)$$

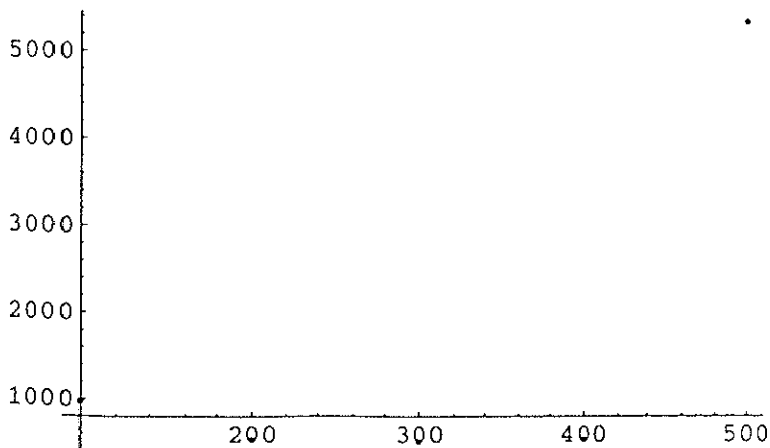
Out[357]= {152.716, 610.865, 1374.44, 2443.45, 3817.88}

Out[358]= {-822.284, 75.8648, 863.443, 1909.45, -1512.12}

Out[359]= 2712.92



Out[360]= - Graphics -



Out[361]= - Graphics -



```

<< Statistics'DataManipulation'
<< Statistics'NonlinearFit'
<< Statistics'LinearRegression'

edata = {{0, 0}, {27, 665}, {29, 1649}, {30, 1205}, {60, 2849}, {88,
3591}, {90, 3890}, {91, 770}, {121, 4361}, {122, 272}, {152, 5327},
{173, 0}, {176, 2800}, {180, 5842}, {182, 1537}, {183, 812}, {202,
252}, {211, 25395}, {213, 1947}, {229, 363}, {244, 2725}, {247,
30489}, {272, 3322}, {275, 3126}, {295, 6500}, {303, 3973}, {321,
691}, {333, 4643}, {334, 4457}, {358, 835}, {364, 5268}, {387, 53853},
{394, 5915}, {395, 6029}, {419, 1360}, {425, 6857}, {430, 19665},
{456, 64655}, {487, 77060}, {532, 92290}, {590,
111531}, {665, 43324}, {681, 129263}, {682, 139257}, {701, 139257},
{713, 147987}, {738, 147987}, {817, 191813}, {897, 244215}, {924,
244215}, {938, 259490}, {987, 300921}, {999, 300921}, {1023, 315627}}

coll = Column[edata, 1]
col2 = Column[edata, 2]

Set::write : Tag Regress in Options[Regress] is Protected.

Set::write : Tag DesignedRegress in Options[DesignedRegress] is Protected.

Set::write : Tag DesignMatrix in Options[DesignMatrix] is Protected.

General::stop : Further output of Set::write will be suppressed during this calculation.

SetDelayed::write : Tag Regress in Regress[data_, basis_, vars_, options___Rule] is Protected.

SetDelayed::write :
  Tag DesignMatrix in DesignMatrix[data_, basis_, vars_, opts___Rule] is Protected.

SetDelayed::write : Tag DesignedRegress in
  DesignedRegress[designMatrix_?MatrixQ, response_?<<7>>, options___Rule] is Protected.

General::stop : Further output of SetDelayed::write will be suppressed during this calculation.

{{0, 0}, {27, 665}, {29, 1649}, {30, 1205}, {60, 2849}, {88, 3591}, {90, 3890}, {91, 770},
{121, 4361}, {122, 272}, {152, 5327}, {173, 0}, {176, 2800}, {180, 5842}, {182, 1537},
{183, 812}, {202, 252}, {211, 25395}, {213, 1947}, {229, 363}, {244, 2725}, {247, 30489},
{272, 3322}, {275, 3126}, {295, 6500}, {303, 3973}, {321, 691}, {333, 4643},
{334, 4457}, {358, 835}, {364, 5268}, {387, 53853}, {394, 5915}, {395, 6029},
{419, 1360}, {425, 6857}, {430, 19665}, {456, 64655}, {487, 77060}, {532, 92290},
{590, 111531}, {665, 43324}, {681, 129263}, {682, 139257}, {701, 139257},
{713, 147987}, {738, 147987}, {817, 191813}, {897, 244215}, {924, 244215},
{938, 259490}, {987, 300921}, {999, 300921}, {1023, 315627}}

{0, 27, 29, 30, 60, 88, 90, 91, 121, 122, 152, 173, 176, 180, 182, 183, 202, 211, 213, 229,
244, 247, 272, 275, 295, 303, 321, 333, 334, 358, 364, 387, 394, 395, 419, 425,
430, 456, 487, 532, 590, 665, 681, 682, 701, 713, 738, 817, 897, 924, 938, 987, 999, 1023}

{0, 665, 1649, 1205, 2849, 3591, 3890, 770, 4361, 272, 5327, 0, 2800, 5842, 1537, 812, 252,
25395, 1947, 363, 2725, 30489, 3322, 3126, 6500, 3973, 691, 4643, 4457, 835, 5268,
53853, 5915, 6029, 1360, 6857, 19665, 64655, 77060, 92290, 111531, 43324, 129263,
139257, 139257, 147987, 147987, 191813, 244215, 244215, 259490, 300921, 300921, 315627}

```

```

mta =
-K (-1.8 c + 3.6 c Exp[c t] / (1 + Exp[2 c t])) Exp[-1.8 c t + 3.6 ArcTan[Exp[c t]] - 0.7854]
ft =
NonlinearFit[edata, mta, t, {{K, 1180000000000}, {c, 0.000033}}, MaxIterations -> 1000,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmta = ft /. t -> coll (* data for fitted mta is now in dmta *)
err = dmta - col2 (* gives error from actual at each point *)
rms = Sqrt[Plus@@ ((dmta - col2) ^2)]
Plot[ft, {t, 0, 1100}]
ListPlot[edata]

```

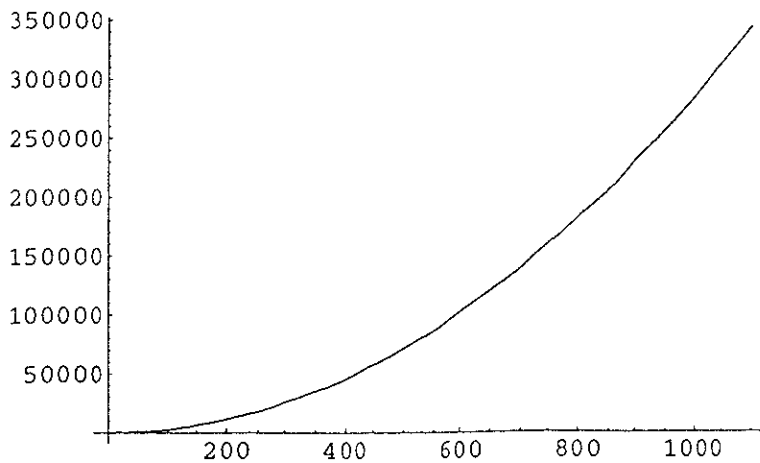
$$-E^{-0.7854-1.8 c t+3.6 \text{ArcTan}[E^{c t}]} \left(-1.8 c + \frac{3.6 c E^{c t}}{1+E^{2 c t}}\right) K$$

$$-1.18 \times 10^{12} E^{-0.7854-0.0000587202 t+3.6 \text{ArcTan}[E^{0.0000126223 t}]} \left(-0.0000587202 + \frac{0.00011744 E^{0.0000326223 t}}{1+E^{0.0000652447 t}}\right)$$

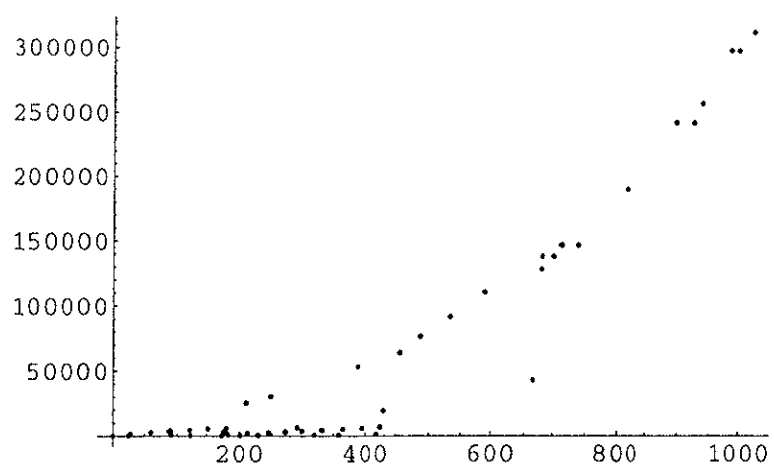
{0., 207.129, 238.952, 255.715, 1022.86, 2200.28, 2301.43, 2352.86, 4159.89, 4228.93, 6564.43, 8503.55, 8801.03, 9205.61, 9411.32, 9515.02, 11593.3, 12649.4, 12890.3, 14899.6, 16915.4, 17333.9, 21020.2, 21486.5, 24725.3, 26084.4, 29275.5, 31505.1, 31694.6, 36412.9, 37643.6, 42550.7, 44103.8, 44328., 49877.9, 51316.5, 52530.9, 59074.9, 67379.2, 80404.8, 98889.5, 125623., 131740., 132127., 139590., 144409., 154711., 189595., 228529., 242488., 249889., 276666., 283432., 297207.)

{0., -457.871, -1410.05, -949.285, -1826.14, -1390.72, -1588.57, 1582.86, -201.109, 3956.93, 1237.43, 8503.55, 6001.03, 3363.61, 7874.32, 8703.02, 11341.3, -12745.6, 10943.3, 14536.6, 14190.4, -13155.1, 17698.2, 18360.5, 18225.3, 22111.4, 28584.5, 26862.1, 27237.6, 35577.9, 32375.6, -11302.3, 38188.8, 38299., 48517.9, 44459.5, 32865.9, -5580.07, -9680.81, -11885.2, -12641.5, 82299.5, 2476.96, -7129.94, 332.863, -3578.23, 6723.6, -2217.88, -15686.3, -1727.13, -9601.33, -24254.6, -17489.4, -18420.1}

157188.



- Graphics -



- Graphics -

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
```

```
Out[4]= 2 a E-a t2 K t
```

```
In[5]:= edata = {{100, 49181}, {200, 108250}, {300, 195735}, {400, 156126}, {500, 0}}
col1 = Column[edata, 1]
col2 = Column[edata, 2]
```

```
Out[5]= {{100, 49181}, {200, 108250}, {300, 195735}, {400, 156126}, {500, 0}}
```

```
Out[6]= {100, 200, 300, 400, 500}
```

```
Out[7]= {49181, 108250, 195735, 156126, 0}
```

```
In[13]:= fx = NonlinearFit[edata, mtlin, t, {{K, 1.9 10^7}, {a, 10^-7}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
```

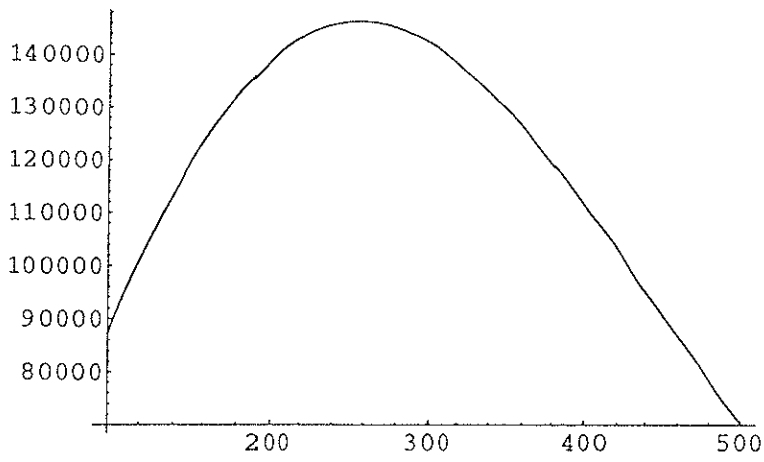
```
Out[13]= 941.828 E-7.60794×10-6 t2 t
```

```
In[14]:= dfx = fx /. t -> col1
rms = Sqrt[Plus@@((dfx - col2) ^2)]
```

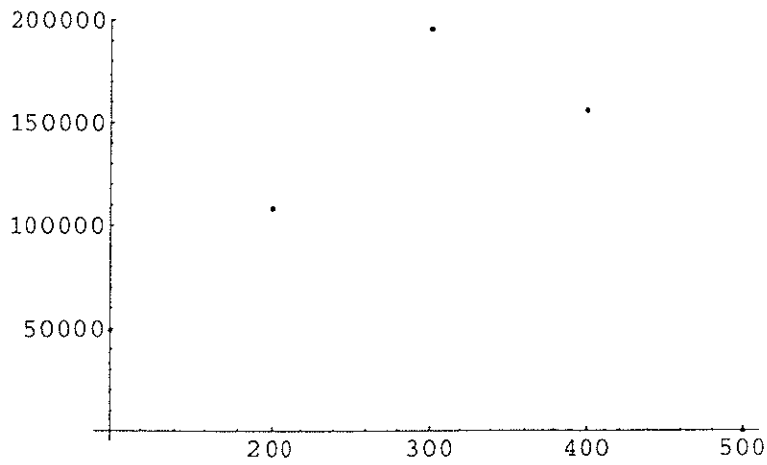
```
Out[14]= {87283.2, 138943., 142471., 111526., 70294.3}
```

```
Out[15]= 110279.
```

```
In[16]:= Plot[fx, {t, 100, 500}]  
ListPlot[edata]
```



```
Out[16]= - Graphics -
```



```
Out[17]= - Graphics -
```

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
```

```
Out[4]= 2 a E-a t2 K t
```

```
In[18]:= edata = {{100, 16507}, {200, 42787}, {300, 84383}, {400, 55426}, {500, 967}}
          col1 = Column[edata, 1]
          col2 = Column[edata, 2]
```

```
Out[18]= {{100, 16507}, {200, 42787}, {300, 84383}, {400, 55426}, {500, 967}}
```

```
Out[19]= {100, 200, 300, 400, 500}
```

```
Out[20]= {16507, 42787, 84383, 55426, 967}
```

```
In[21]:= fx = NonlinearFit[edata, mtlin, t, {{K, 3 10^7}, {a, 10^-6}}, MaxIterations -> 100,
          PrecisionGoal -> 1, AccuracyGoal -> 1]
```

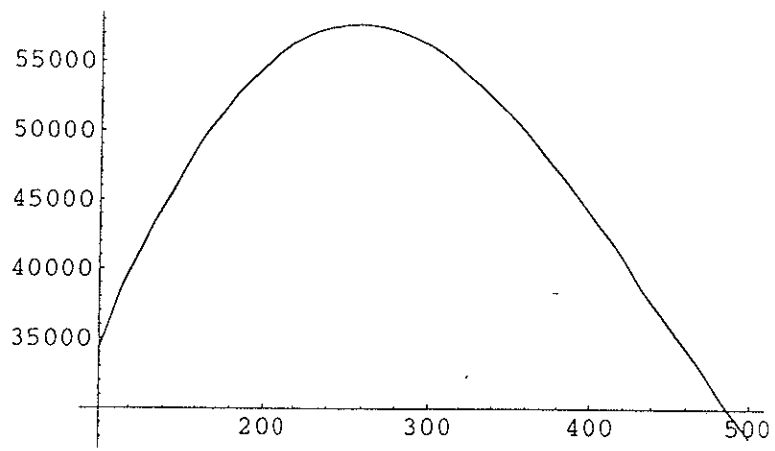
```
Out[21]= 370.354 E-7.56922×10-6 t2 t
```

```
In[22]:= dfx = fx /. t -> col1
          rms = Sqrt[Plus@@((dfx - col2)^2)]
```

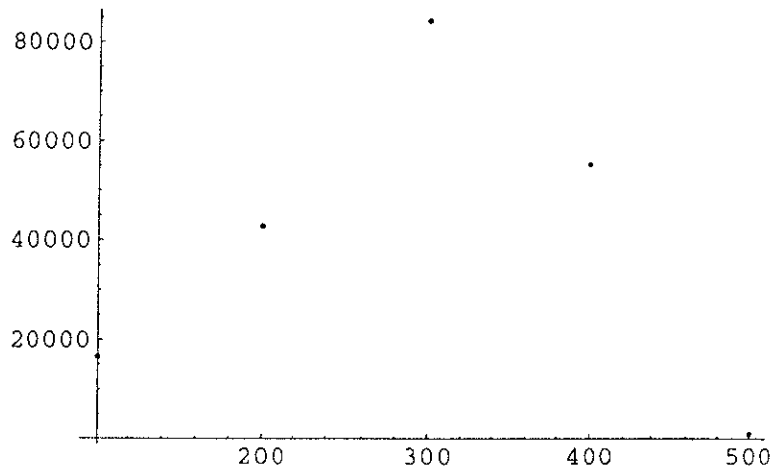
```
Out[22]= {34335.6, 54721.3, 56219.1, 44127.9, 27910.6}
```

```
Out[23]= 45903.1
```

```
In[24]:= Plot[fx, {t, 100, 500}]  
ListPlot[edata]
```



Out[24]= - Graphics -



Out[25]= - Graphics -

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
```

```
Out[4]= 2 a E^{-a t^2} K t
```

```
In[26]:= edata = {{100, 314}, {200, 476}, {300, 666}, {400, 877}, {500, 173}}
          col1 = Column[edata, 1]
          col2 = Column[edata, 2]
```

```
Out[26]= {{100, 314}, {200, 476}, {300, 666}, {400, 877}, {500, 173}}
```

```
Out[27]= {100, 200, 300, 400, 500}
```

```
Out[28]= {314, 476, 666, 877, 173}
```

```
In[71]:= fx = NonlinearFit[edata, mtlin, t, {{K, 3.07 10^5}, {a, 10^-5}}, MaxIterations -> 100,
          PrecisionGoal -> 1, AccuracyGoal -> 1]
```

```
Out[71]= 3.66808 E^{-5.84776 \times 10^{-6} t^2} t
```

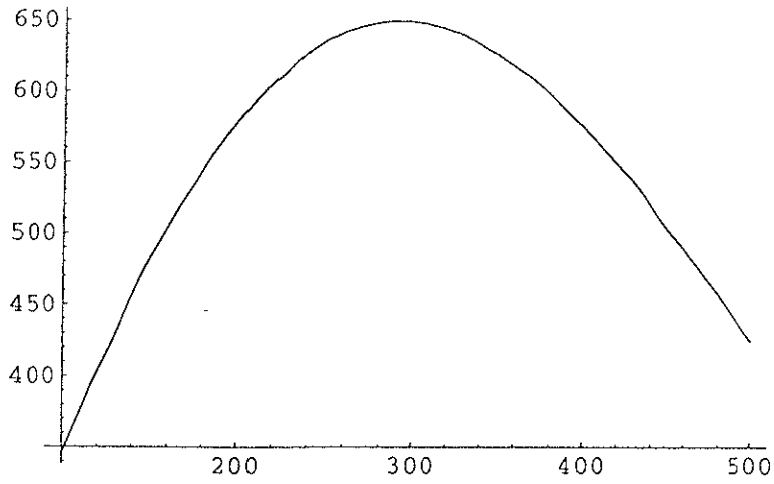
```
In[72]:= dfx = fx /. t -> col1
          rms = Sqrt[Plus@@((dfx - col2)^2)]
```

```
Out[72]= {345.973, 580.608, 650.118, 575.646, 425.105}
```

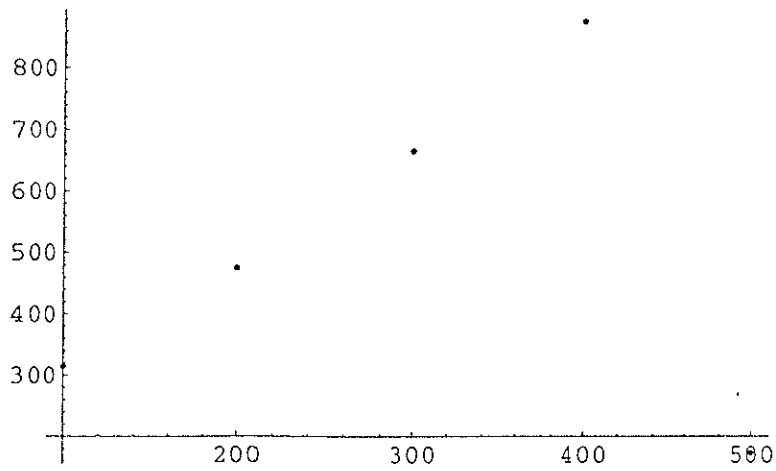
```
Out[73]= 408.153
```



```
In[74]:= Plot[fx, {t, 100, 500}]
ListPlot[edata]
```



Out[74]= - Graphics -



Out[75]= - Graphics -

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
Out[4]= 2 a E^{-a t^2} K t

In[76]:= edata = {{100, 480}, {200, 636}, {300, 1000}, {400, 500}, {500, 145}}
          col1 = Column[edata, 1]
          col2 = Column[edata, 2]
Out[76]= {{100, 480}, {200, 636}, {300, 1000}, {400, 500}, {500, 145}}

Out[77]= {100, 200, 300, 400, 500}

Out[78]= {480, 636, 1000, 500, 145}

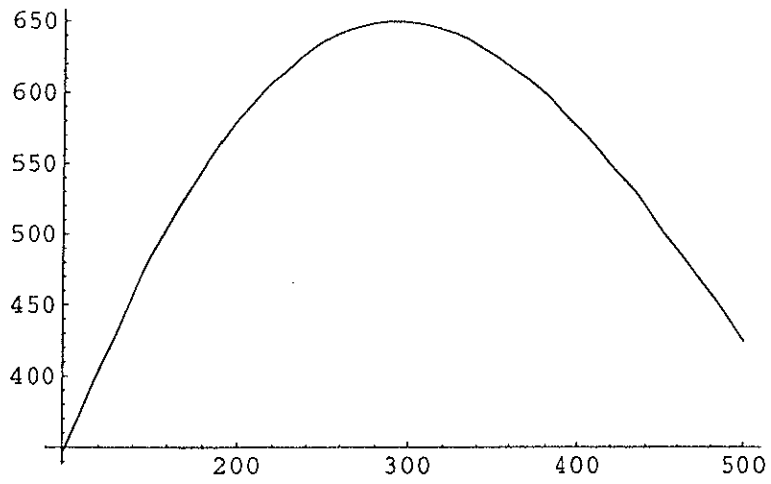
In[79]:= fx = NonlinearFit[edata, mtlin, t, {{K, 4 10^5}, {a, 10^-5}}, MaxIterations -> 100,
          PrecisionGoal -> 1, AccuracyGoal -> 1]

Out[79]= 5.66333 E^{-9.15247 \times 10^{-6} t^2} t

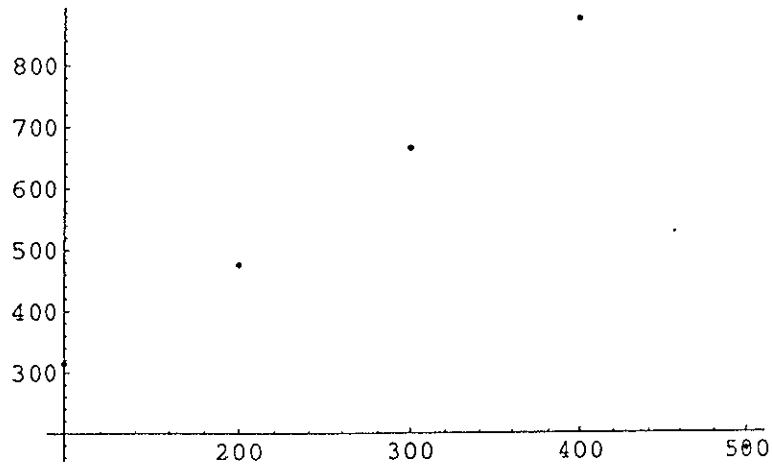
In[80]:= dfx = fx /. t -> col1
          rms = Sqrt[Plus@@((dfx - col2)^2)]
Out[80]= {516.801, 785.429, 745.512, 523.785, 287.293}

Out[81]= 330.545
```

```
In[74]:= Plot[fx, {t, 100, 500}]  
ListPlot[edata]
```



```
Out[74]= - Graphics -
```



```
Out[75]= - Graphics -
```

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
```

```
Out[4]= 2 a E-a t2 K t
```

```
In[107]:= edata = {{100, 213}, {200, 263}, {300, 885}, {400, 182}, {500, 60}}
col1 = Column[edata, 1]
col2 = Column[edata, 2]
```

```
Out[107]= {{100, 213}, {200, 263}, {300, 885}, {400, 182}, {500, 60}}
```

```
Out[108]= {100, 200, 300, 400, 500}
```

```
Out[109]= {213, 263, 885, 182, 60}
```

```
In[110]:= fx = NonlinearFit[edata, mtlin, t, {{K, 5 10^6}, {a, 1 10^-4}}, MaxIterations->100,
PrecisionGoal->1, AccuracyGoal->1]
```

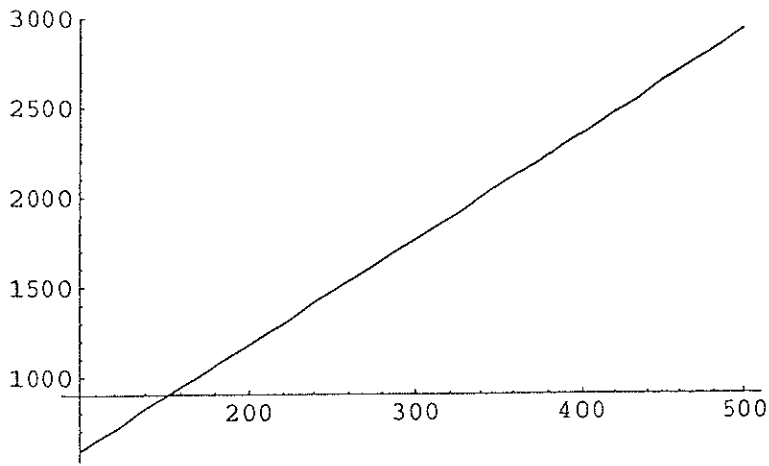
```
Out[110]= 3.4269 E-9.36724x10-6 t2 t
```

```
In[111]:= dfx = fx /. t -> col1
rms = Sqrt[Plus@@(dfx - col2)^2]
```

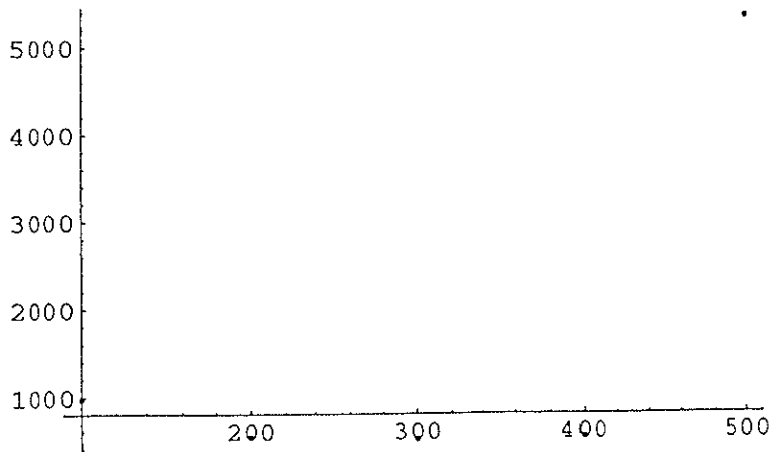
```
Out[111]= {312.047, 471.2, 442.476, 306.238, 164.754}
```

```
Out[112]= 524.779
```

```
In[105]:= Plot[fx, {t, 100, 500}]  
ListPlot[edata]
```



Out[105]= - Graphics -



Out[106]= - Graphics -

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
```

```
Out[4]= 2 a E-a t2 K t
```

```
In[82]:= edata = {{100, 1330}, {200, 1730}, {300, 2580}, {400, 1350}, {500, 300}}
col1 = Column[edata, 1]
col2 = Column[edata, 2]
```

```
Out[82]= {{100, 1330}, {200, 1730}, {300, 2580}, {400, 1350}, {500, 300}}
```

```
Out[83]= {100, 200, 300, 400, 500}
```

```
Out[84]= {1330, 1730, 2580, 1350, 300}
```

```
In[85]:= fx = NonlinearFit[edata, mtlin, t, {{K, 5 10^5}, {a, 9 10^-6}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
```

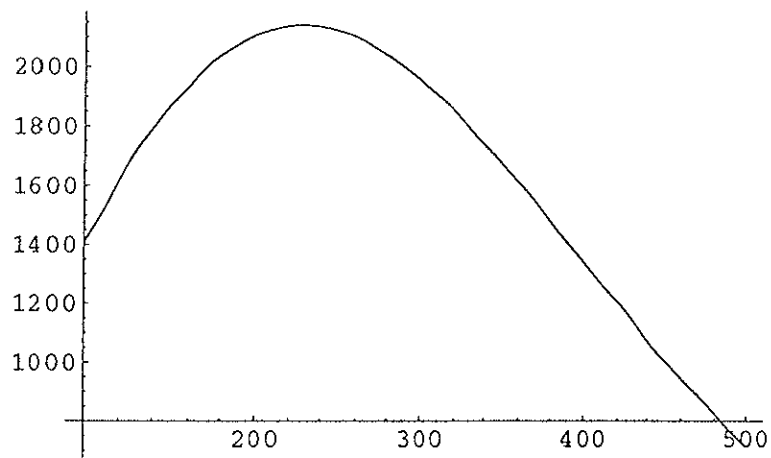
```
Out[85]= 15.4742 E-9.54233x10-6 t2 t
```

```
In[86]:= dfx = fx /. t -> col1
rms = Sqrt[Plus@@((dfx - col2)^2)]
```

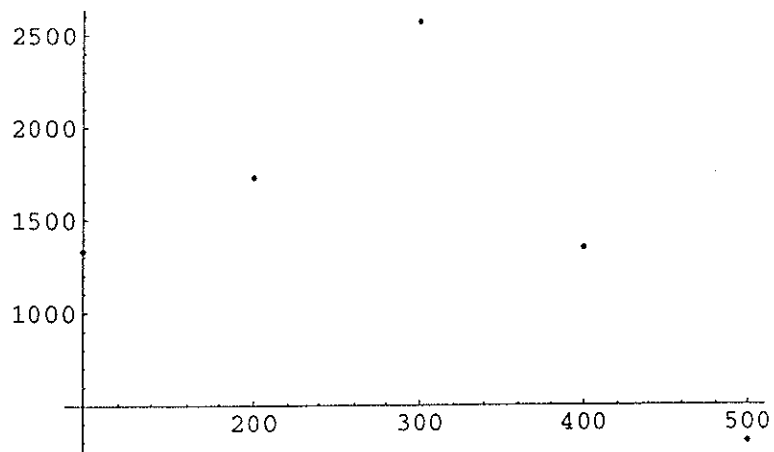
```
Out[86]= {1406.59, 2112.87, 1966.77, 1344.62, 712.088}
```

```
Out[87]= 835.671
```

```
In[88]:= Plot[fx, {t, 100, 500}]  
ListPlot[edata]
```



```
Out[88]= - Graphics -
```



```
Out[89]= - Graphics -
```

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
```

```
Out[4]= 2 a E^{-a t^2} K t
```

```
In[113]:= edata = {{100, 833}, {200, 1053}, {300, 1587}, {400, 787}, {500, 0}}
           col1 = Column[edata, 1]
           col2 = Column[edata, 2]
```

```
Out[113]= {{100, 833}, {200, 1053}, {300, 1587}, {400, 787}, {500, 0}}
```

```
Out[114]= {100, 200, 300, 400, 500}
```

```
Out[115]= {833, 1053, 1587, 787, 0}
```

```
In[119]:= fx = NonlinearFit[edata, mtlin, t, {{K, 1 10^8}, {a, 1 10^-9}}, MaxIterations -> 100,
           PrecisionGoal -> 1, AccuracyGoal -> 1]
```

```
Out[119]= 1.97911 E^{-9.89554 \times 10^{-9} t^2} t
```

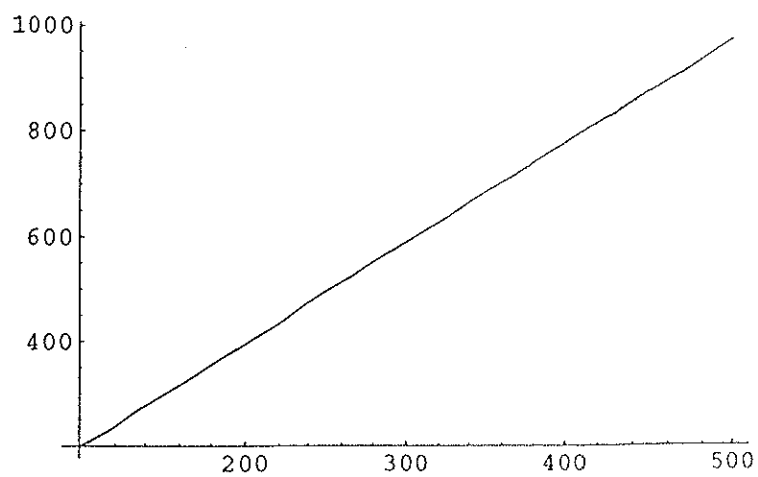
```
In[120]:= dfx = fx /. t -> col1
           rms = Sqrt[Plus@@((dfx - col2) ^2)]
```

```
Out[120]= {197.891, 395.665, 593.204, 790.391, 987.109}
```

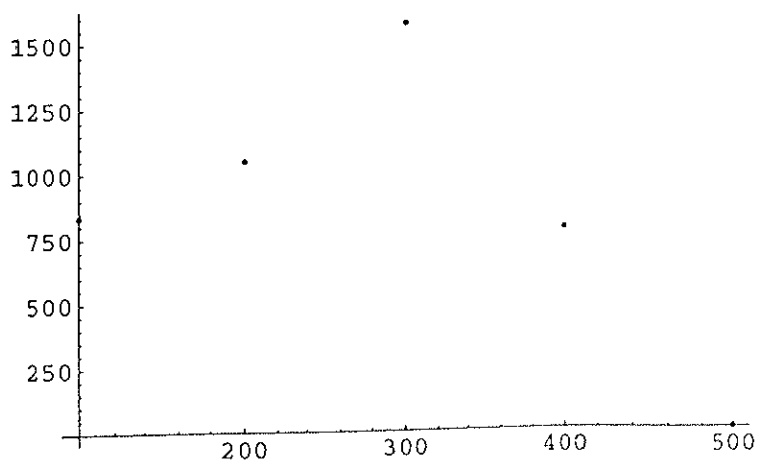
```
Out[121]= 1672.57
```



```
In[122]:= Plot[fx, {t, 100, 500}]
ListPlot[edata]
```



Out[122]= - Graphics -



Out[123]= - Graphics -

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
```

```
Out[4]= 2 a E^{-a t^2} K t
```

```
In[124]:= edata = {{100, 30}, {200, 30}, {300, 40}, {400, 35}, {500, 221}}
          col1 = Column[edata, 1]
          col2 = Column[edata, 2]
```

```
Out[124]= {{100, 30}, {200, 30}, {300, 40}, {400, 35}, {500, 221}}
```

```
Out[125]= {100, 200, 300, 400, 500}
```

```
Out[126]= {30, 30, 40, 35, 221}
```

```
In[127]:= fx = NonlinearFit[edata, mtlin, t, {{K, 4 10^7}, {a, 1 10^-7}}, MaxIterations -> 100,
          PrecisionGoal -> 1, AccuracyGoal -> 1]
```

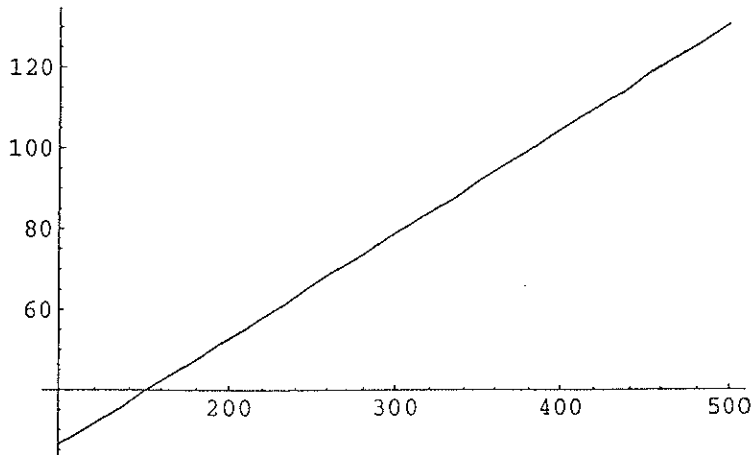
```
Out[127]= 0.264637 E^{-3.30797 \times 10^{-9} t^2} t
```

```
In[128]:= dfx = fx /. t -> col1
          rms = Sqrt[Plus@@{(dfx - col2) ^ 2}]
```

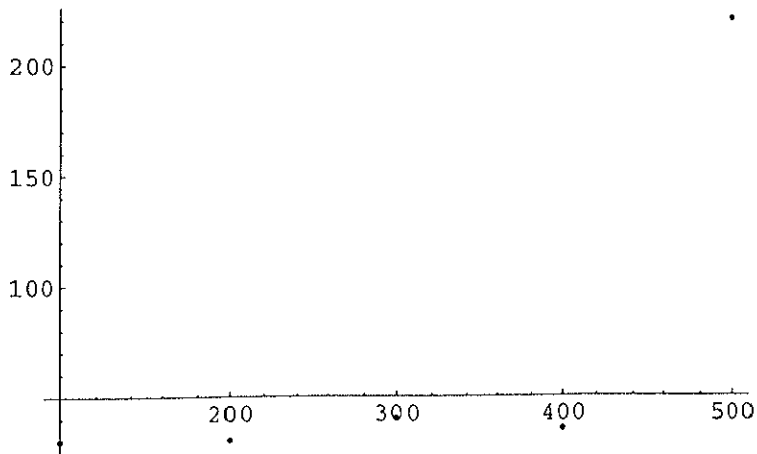
```
Out[128]= {26.4628, 52.9204, 79.3675, 105.799, 132.209}
```

```
Out[129]= 122.409
```

```
In[130]:= Plot[fx, {t, 100, 500}]  
ListPlot[edata]
```



Out[130]= - Graphics -



Out[131]= - Graphics -

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
```

```
Out[4]= 2 a E-a t2 K t
```

```
In[132]:= edata = {{100, 6004}, {200, 7674}, {300, 18879}, {400, 6022}, {500, 5}}
col1 = Column[edata, 1]
col2 = Column[edata, 2]
```

```
Out[132]= {{100, 6004}, {200, 7674}, {300, 18879}, {400, 6022}, {500, 5}}
```

```
Out[133]= {100, 200, 300, 400, 500}
```

```
Out[134]= {6004, 7674, 18879, 6022, 5}
```

```
In[135]:= fx = NonlinearFit[edata, mtlin, t, {{K, 5 10^9}, {a, 9 10^-5}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
```

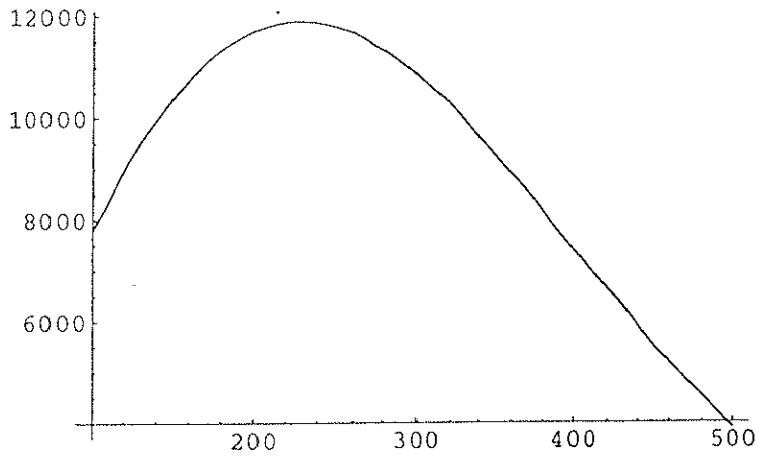
```
Out[135]= 85.924 E-9.5954x10-6 t2 t
```

```
In[136]:= dfx = fx /. t -> col1
rms = Sqrt[Plus@@((dfx - col2) ^ 2)]
```

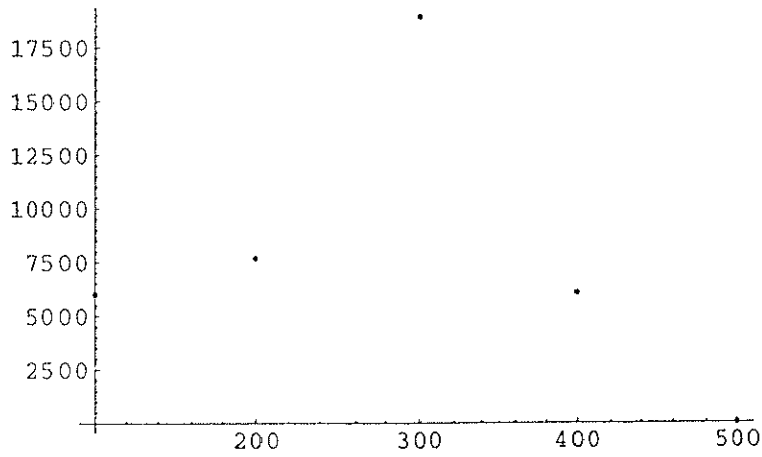
```
Out[136]= {7806.24, 11707.3, 10868.9, 7403.17, 3901.91}
```

```
Out[137]= 10038.5
```

```
In[138]:= Plot[fx, {t, 100, 500}]  
ListPlot[edata]
```



Out[138]= - Graphics -



Out[139]= - Graphics -

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
```

```
Out[4]= 2 a E-a t2 K t
```

```
In[90]:= edata = {{100, 172}, {200, 234}, {300, 352}, {400, 164}, {500, 1573}}
col1 = Column[edata, 1]
col2 = Column[edata, 2]
```

```
Out[90]= {{100, 172}, {200, 234}, {300, 352}, {400, 164}, {500, 1573}}
```

```
Out[91]= {100, 200, 300, 400, 500}
```

```
Out[92]= {172, 234, 352, 164, 1573}
```

```
In[93]:= fx = NonlinearFit[edata, mtlin, t, {{K, 110^9}, {a, 110^-4}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
```

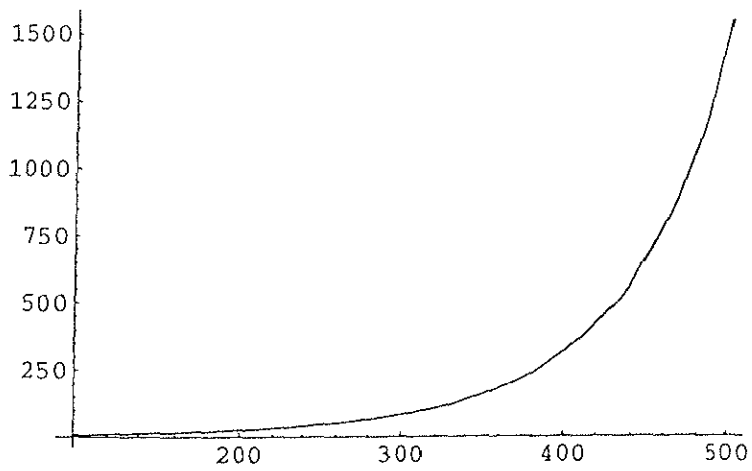
```
Out[93]= 0.0715355 E0.0000150733 t2 t
```

```
In[94]:= dfx = fx /. t -> col1
rms = Sqrt[Plus@@((dfx - col2)^2)]
```

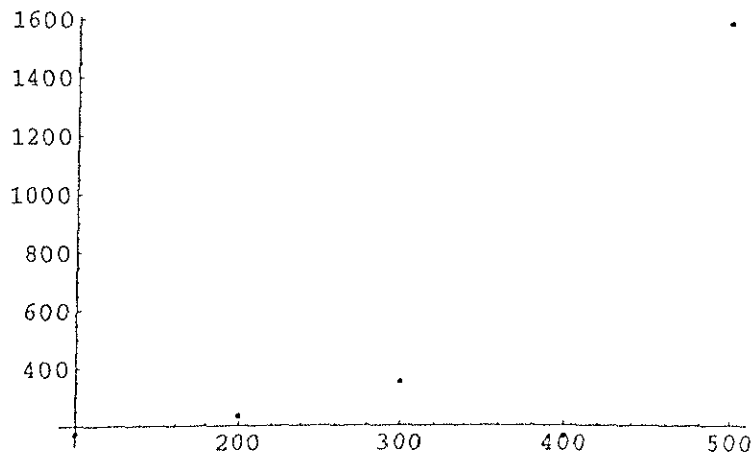
```
Out[94]= {8.31733, 26.1457, 83.3305, 319.138, 1548.99}
```

```
Out[95]= 408.44
```

```
In[96]:= Plot[fx, {t, 100, 500}]
ListPlot[edata]
```



Out [96]= - Graphics -



Out [97]= - Graphics -

```
In[4]:= mtlin = 2 K a t Exp[-a t^2]
```

```
Out[4]= 2 a E^{-a t^2} K t
```

```
In[98]:= edata = {{100, 975}, {200, 535}, {300, 511}, {400, 534}, {500, 5330}}
col1 = Column[edata, 1]
col2 = Column[edata, 2]
```

```
Out[98]= {{100, 975}, {200, 535}, {300, 511}, {400, 534}, {500, 5330}}
```

```
Out[99]= {100, 200, 300, 400, 500}
```

```
Out[100]= {975, 535, 511, 534, 5330}
```

```
In[102]:= fx = NonlinearFit[edata, mtlin, t, {{K, 4 10^9}, {a, 1 10^-9}}, MaxIterations -> 100,
PrecisionGoal -> 1, AccuracyGoal -> 1]
```

```
Out[102]= 5.88475 E^{-7.35594x10^{-10} t^2} t
```

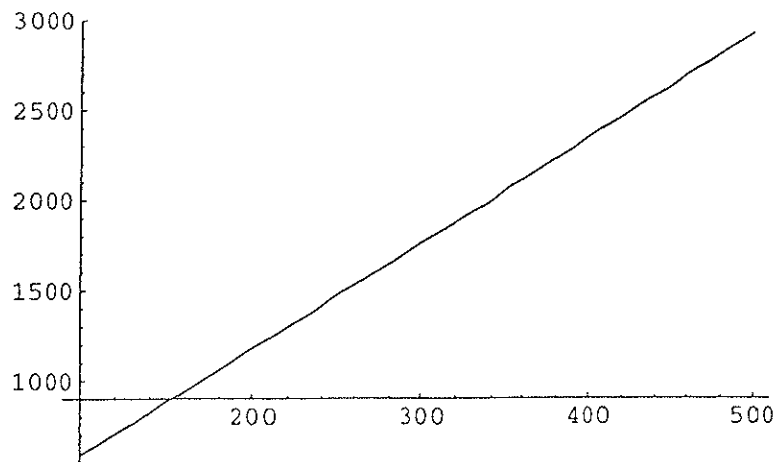
```
In[103]:= dfx = fx /. t -> col1
rms = Sqrt[Plus@@(dfx - col2)^2]
```

```
Out[103]= {588.471, 1176.92, 1765.31, 2353.62, 2941.83}
```

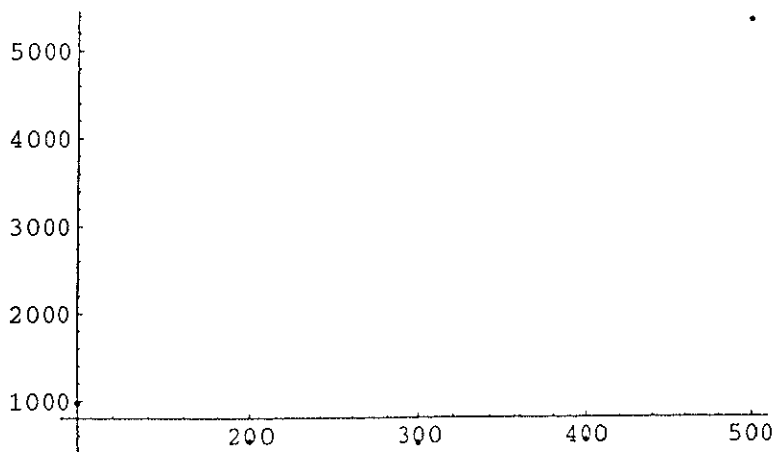
```
Out[104]= 3339.03
```



```
In[105]:= Plot[fx, {t, 100, 500}]  
ListPlot[edata]
```



```
Out[105]= - Graphics -
```



```
Out[106]= - Graphics -
```

```
In[363]:= mtr = Ka (1 - Exp[-c t]) Exp[-a t - a/c Exp[-c t] + a/c]
```

```
Out[363]= a E $\frac{a}{c} - \frac{a e^{-c t}}{c} - a t$  (1 - E-c t) K
```

```
In[364]:= edata = {{100, 49181}, {200, 108250}, {300, 195735}, {400, 156126}, {500, 0}}  
col1 = Column[edata, 1]  
col2 = Column[edata, 2]
```

```
Out[364]= {{100, 49181}, {200, 108250}, {300, 195735}, {400, 156126}, {500, 0}}
```

```
Out[365]= {100, 200, 300, 400, 500}
```

```
Out[366]= {49181, 108250, 195735, 156126, 0}
```

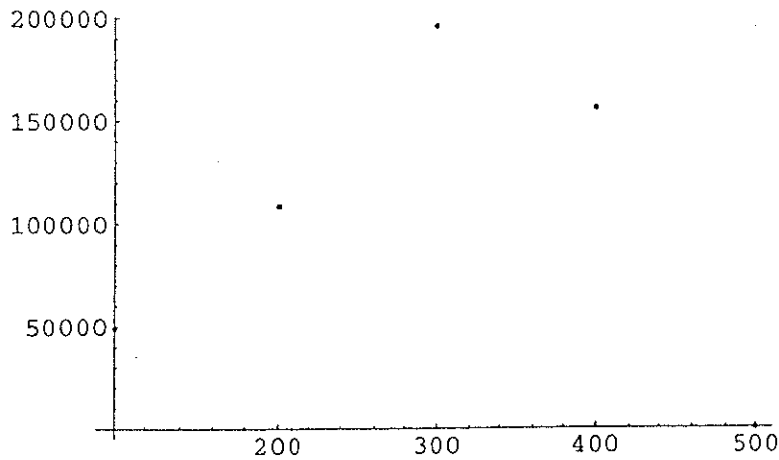
```
In[517]:= ft = NonlinearFit[edata, mtr, t,
  {{K, 210^8}, {c, .9 10^-2}, {a, 1.4 10^-4}}, MaxIterations -> 100,
  PrecisionGoal -> 1, AccuracyGoal -> 1]
dmtr = ft /. t -> col1
err = dmtr - col2
rms = Sqrt[Plus@@((dmtr - col2)^2)]
ListPlot[edata]
Plot[ft, {t, 100, 500}]
```

Out[517]=  $153232. E^{0.121872 - 0.121872 E^{-0.00829152 t} - 0.00101051 t} (1 - E^{-0.00829152 t})$

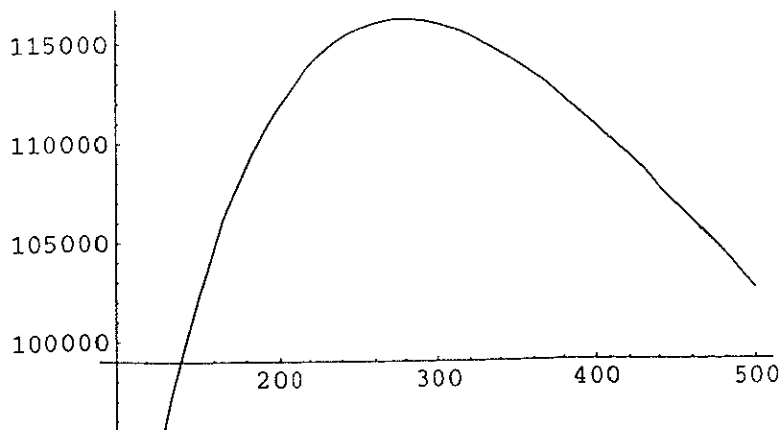
Out[518]= {83608.1, 111857., 116020., 110858., 102584.}

Out[519]= {34427.1, 3606.67, -79715.2, -45268.1, 102584.}

Out[520]= 141864.



Out[521]= - Graphics -



Out[522]= - Graphics -

```
In[363]:= mtr = Ka (1 - Exp[-c t]) Exp[-a t - a/c Exp[-c t] + a/c]
```

```
Out[363]=  $a E^{\frac{a}{c} - \frac{a E^{-ct}}{c} - a t} (1 - E^{-ct}) K$ 
```

```
In[523]:= edata = {{100, 16507}, {200, 42787}, {300, 84383}, {400, 55426}, {500, 967}}  
col1 = Column[edata, 1]  
col2 = Column[edata, 2]
```

```
Out[523]= {{100, 16507}, {200, 42787}, {300, 84383}, {400, 55426}, {500, 967}}
```

```
Out[524]= {100, 200, 300, 400, 500}
```

```
Out[525]= {16507, 42787, 84383, 55426, 967}
```

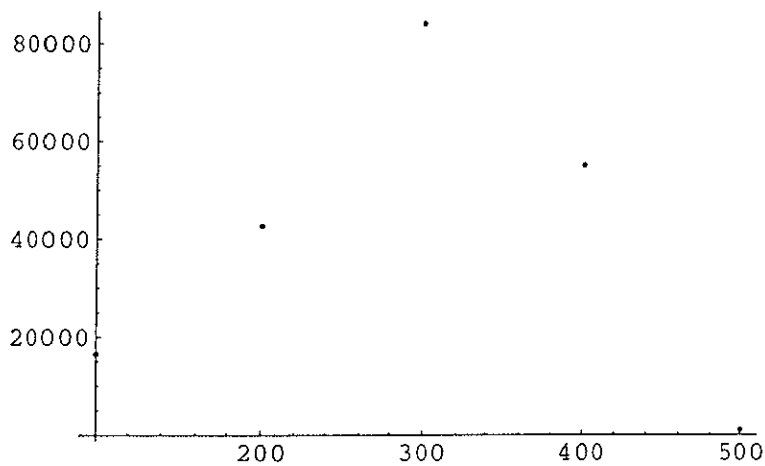
```
In[526]:= ft = NonlinearFit[edata, mtr, t,  
  {{K, 2.09 10^7}, {c, 10^-3}, {a, 1 10^-3}}, MaxIterations -> 100,  
  PrecisionGoal -> 1, AccuracyGoal -> 1]  
dmtr = ft /. t -> col1  
err = dmtr - col2  
rms = Sqrt[Plus@@((dmtr - col2)^2)]  
ListPlot[edata]  
Plot[ft, {t, 100, 500}]
```

Out[526]=  $-88165.9 E^{1.45924-1.45924 E^{0.00290834 t}+0.00424398 t} (1 - E^{0.00290834 t})$

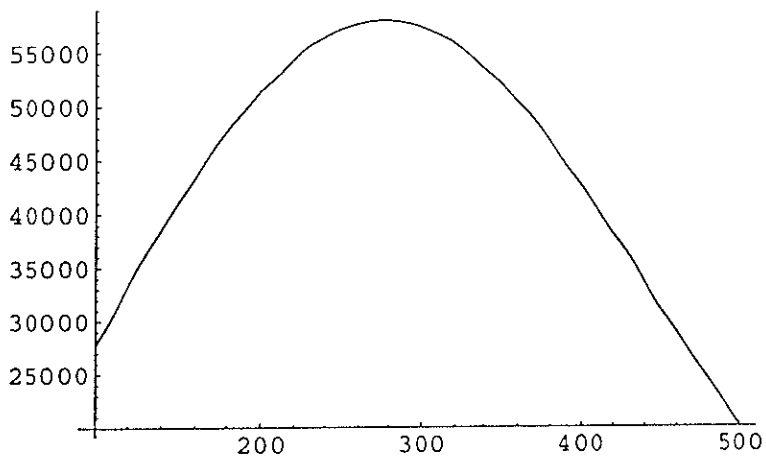
Out[527]= {27798.9, 51402.1, 57468., 42705.9, 20118.9}

Out[528]= {11291.9, 8615.12, -26915., -12720.1, 19151.9}

Out[529]= 38141.1



Out[530]= - Graphics -



Out[531]= - Graphics -

```
In[363]:= mtr = Ka (1 - Exp[-c t]) Exp[-a t - a/c Exp[-c t] + a/c]
```

```
Out[363]=  $a E^{\frac{a}{c} - \frac{a e^{-c t}}{c} - a t} (1 - E^{-c t}) K$ 
```

```
In[532]:= edata = {{100, 314}, {200, 476}, {300, 666}, {400, 877}, {500, 173}}
          col1 = Column[edata, 1]
          col2 = Column[edata, 2]
```

```
Out[532]= {{100, 314}, {200, 476}, {300, 666}, {400, 877}, {500, 173}}
```

```
Out[533]= {100, 200, 300, 400, 500}
```

```
Out[534]= {314, 476, 666, 877, 173}
```

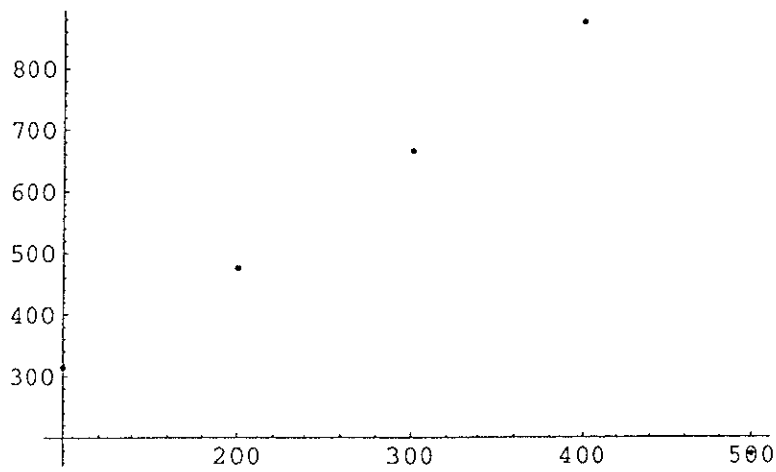
```
In[535]:= ft = NonlinearFit[edata, mtr, t,
  {{K, 3.18 10^5}, {c, 1.9 10^-2}, {a, 1.9 10^-2}}, MaxIterations -> 100,
  PrecisionGoal -> 1, AccuracyGoal -> 1]
dmtr = ft /. t -> col1
err = dmtr - col2
rms = Sqrt[Plus@@((dmtr - col2)^2)]
ListPlot[edata]
Plot[ft, {t, 100, 500}]
```

Out[535]=  $1772.35 E^{2.42416-2.42416 E^{-0.00197847} t}-0.00479613 t (1 - E^{-0.00197847 t})$

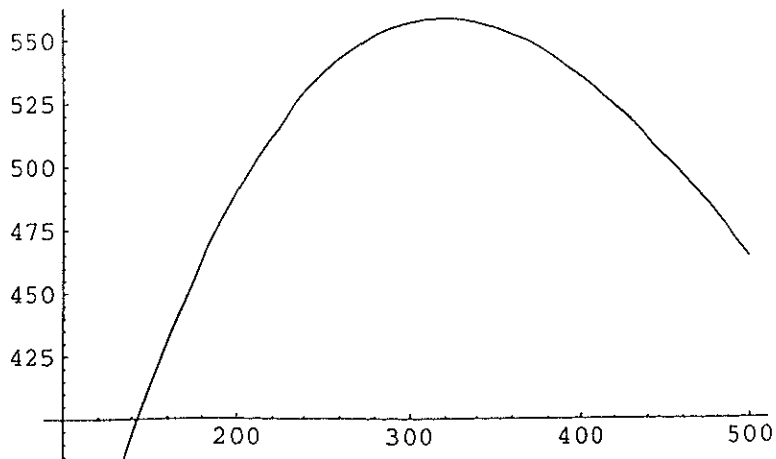
Out[536]= {304.309, 490.083, 557.004, 535.609, 463.921}

Out[537]= {-9.69127, 14.0834, -108.996, -341.391, 290.921}

Out[538]= 461.904



Out[539]= - Graphics -



Out[540]= - Graphics -

```
In[363]:= mtr = Ka (1 - Exp[-c t]) Exp[-a t - a/c Exp[-c t] + a/c]
```

```
Out[363]=  $a E^{\frac{a}{c} - \frac{a E^{-c t}}{c} - a t} (1 - E^{-c t}) K$ 
```

```
In[541]:= edata = {{100, 480}, {200, 636}, {300, 1000}, {400, 500}, {500, 145}}
          col1 = Column[edata, 1]
          col2 = Column[edata, 2]
```

```
Out[541]= {{100, 480}, {200, 636}, {300, 1000}, {400, 500}, {500, 145}}
```

```
Out[542]= {100, 200, 300, 400, 500}
```

```
Out[543]= {480, 636, 1000, 500, 145}
```



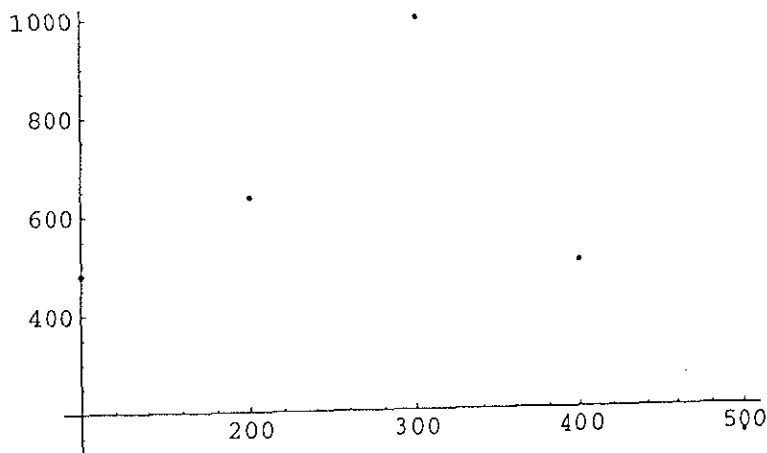
```
In[544]:= ft = NonlinearFit[edata, mtr, t,
  {{K, 2.05 10^6}, {c, 8 10^-3}, {a, 8 10^-3}}, MaxIterations -> 100,
  PrecisionGoal -> 1, AccuracyGoal -> 1]
dmtr = ft /. t -> col1
err = dmtr - col2
rms = Sqrt[Plus@@((dmtr - col2)^2)]
ListPlot[edata]
Plot[ft, {t, 100, 500}]
```

```
Out[544]= 3766.95 E6.20609-6.20609 E-0.00166111 t-0.010309 t (1 - E-0.00166111 t)
```

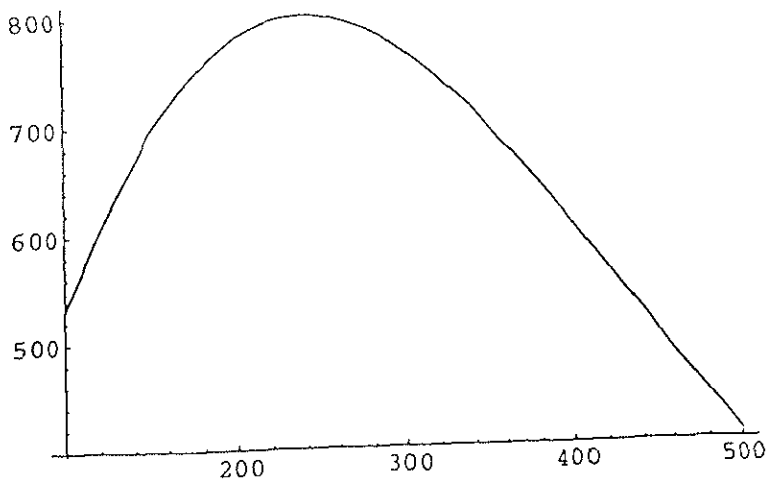
```
Out[545]= {531.627, 782.927, 766.335, 602.092, 406.911}
```

```
Out[546]= {51.627, 146.927, -233.665, 102.092, 261.911}
```

```
Out[547]= 397.331
```



```
Out[548]= - Graphics -
```



```
Out[549]= - Graphics -
```

```
In[363]:= mtr = Ka (1 - Exp[-c t]) Exp[-a t - a/c Exp[-c t] + a/c]
```

```
Out[363]=  $a E^{\frac{a}{c} - \frac{a e^{-c t}}{c} - a t} (1 - E^{-c t}) K$ 
```

```
In[595]:= edata =  
  {{100, 213}, {200, 263}, {300, 885}, {400, 182}, {500, 60}}  
  col1 = Column[edata, 1]  
  col2 = Column[edata, 2]
```

```
Out[595]= {{100, 213}, {200, 263}, {300, 885}, {400, 182}, {500, 60}}
```

```
Out[596]= {100, 200, 300, 400, 500}
```

```
Out[597]= {213, 263, 885, 182, 60}
```

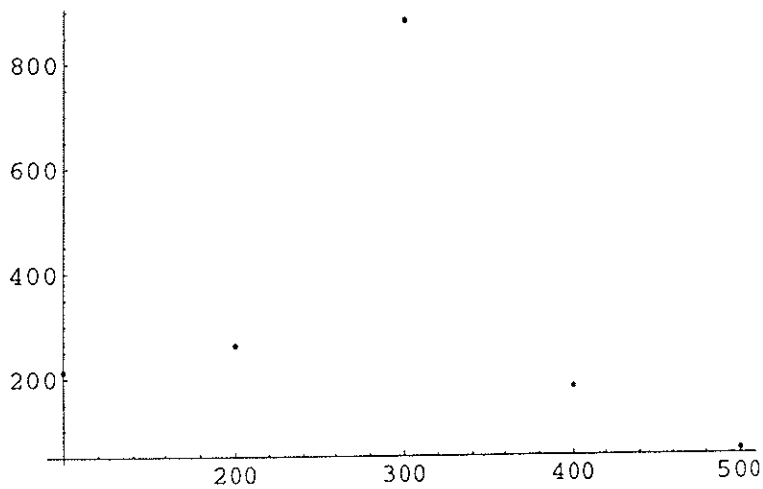
```
In[598]:= ft =
  NonlinearFit[edata, mtr, t, {{K, 210^6}, {c, .9}, {a, 110^-7}}, MaxIterations -> 100,
  PrecisionGoal -> 1, AccuracyGoal -> 1]
dmtr = ft /. t -> col1
err = dmtr - col2
rms = Sqrt[Plus@@((dmtr - col2)^2)]
ListPlot[edata]
Plot[ft, {t, 100, 500}]
```

Out[598]=  $338.665 E^{9.01566 \times 10^{-8}} - 9.01566 \times 10^{-8} E^{-1879.62 t} - 0.00016946 t (1 - E^{-1879.62 t})$

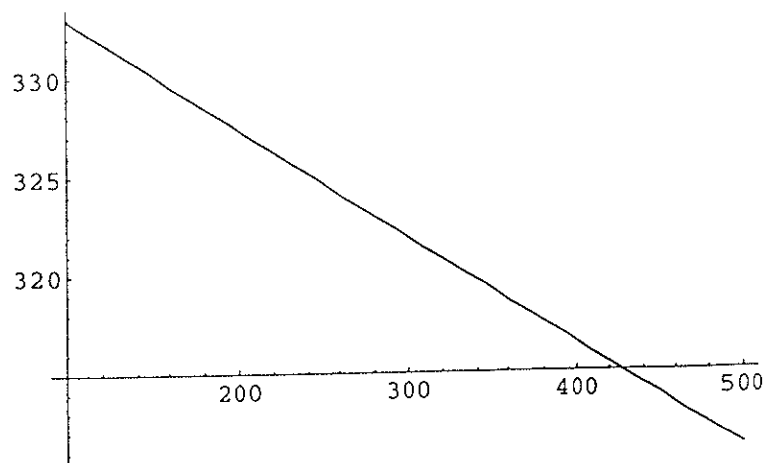
Out[599]= {332.974, 327.379, 321.878, 316.47, 311.152}

Out[600]= {119.974, 64.3792, -563.122, 134.47, 251.152}

Out[601]= 645.604



Out[602]= - Graphics -



Out[603]= - Graphics -

```
In[363]:= mtr = Ka (1 - Exp[-c t]) Exp[-a t - a / c Exp[-c t] + a / c]
```

```
Out[363]=  $a E^{\frac{a}{c} - \frac{a e^{-c t}}{c} - a t} (1 - E^{-c t}) K$ 
```

```
In[550]:= edata = {{100, 1330}, {200, 1730}, {300, 2580}, {400, 1350}, {500, 300}}
          col1 = Column[edata, 1]
          col2 = Column[edata, 2]
```

```
Out[550]= {{100, 1330}, {200, 1730}, {300, 2580}, {400, 1350}, {500, 300}}
```

```
Out[551]= {100, 200, 300, 400, 500}
```

```
Out[552]= {1330, 1730, 2580, 1350, 300}
```

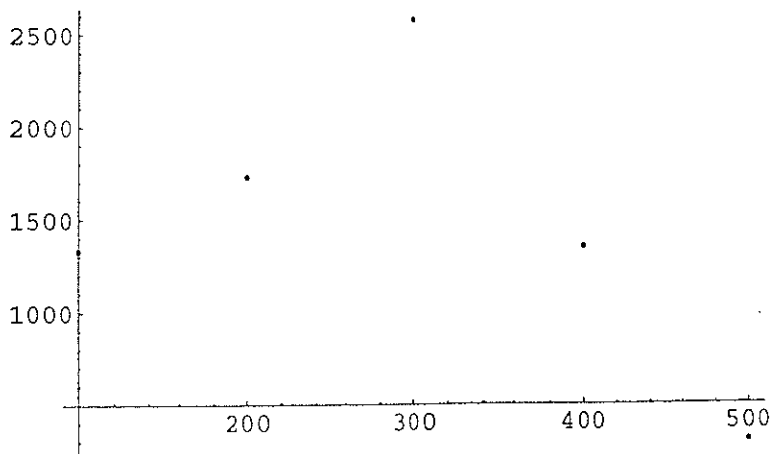
```
In [553]:= ft = NonlinearFit[edata, mtr,
    t, {{K, 3 10^6}, {c, 5 10^-4}, {a, 5 10^-4}}, MaxIterations->100,
    PrecisionGoal->1, AccuracyGoal->1]
dmtr = ft /. t->col1
err = dmtr - col2
rms = Sqrt[Plus@@((dmtr - col2)^2)]
ListPlot[edata]
Plot[ft, {t, 100, 500}]
```

Out [553]=  $-1492.48 E^{0.3842-0.3842 E^{0.00535804 t}+0.00205856 t} (1 - E^{0.00535804 t})$

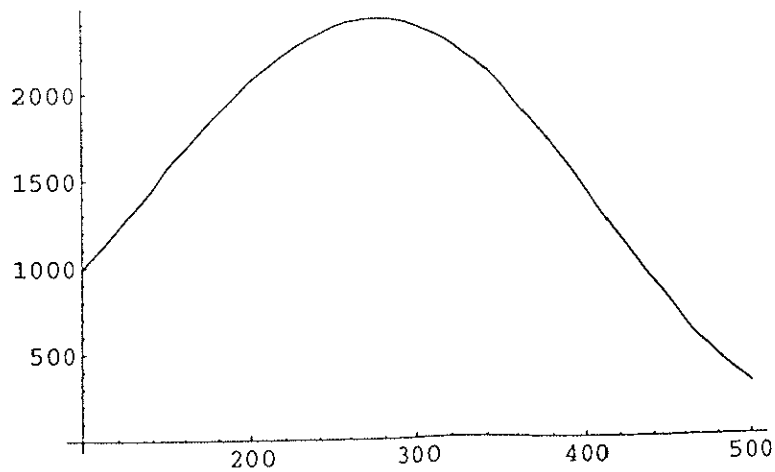
Out [554]= {989.862, 2068.49, 2384.18, 1419.82, 308.431}

Out [555]= {-340.138, 338.489, -195.824, 69.8237, 8.43082}

Out [556]= 523.031



Out [557]= - Graphics -



Out [558]= - Graphics -

```
In[363]:= mtr = Ka (1 - Exp[-c t]) Exp[-a t - a / c Exp[-c t] + a / c]
```

```
Out[363]=  $a E^{\frac{a}{c} - \frac{a E^{-c t}}{c} - a t} (1 - E^{-c t}) K$ 
```

```
In[604]:= edata = {{100, 833}, {200, 1053}, {300, 1587}, {400, 787}, {500, 0}}
```

```
col1 = Column[edata, 1]  
col2 = Column[edata, 2]
```

```
Out[604]= {{100, 833}, {200, 1053}, {300, 1587}, {400, 787}, {500, 0}}
```

```
Out[605]= {100, 200, 300, 400, 500}
```

```
Out[606]= {833, 1053, 1587, 787, 0}
```

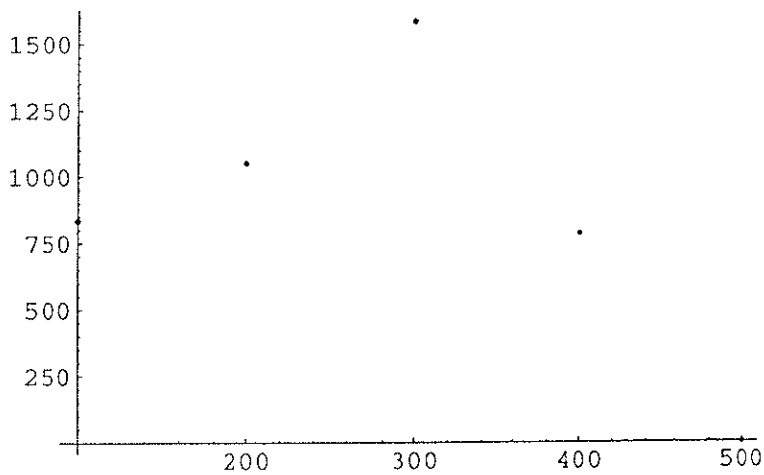
```
In[607]:= ft = NonlinearFit[edata, mtr,
  t, {{K, 5 10^5}, {c, 1.9}, {a, 2 10^-4}}, MaxIterations -> 100,
  PrecisionGoal -> 1, AccuracyGoal -> 1]
dmtr = ft /. t -> col1
err = dmtr - col2
rms = Sqrt[Plus@@((dmtr - col2)^2)]
ListPlot[edata]
Plot[ft, {t, 100, 500}]
```

Out[607]=  $1486.43 E^{1.36878 \times 10^{-8}} - 1.36878 \times 10^{-8} E^{-150962. t} - 0.00206634 t (1 - E^{-150962. t})$

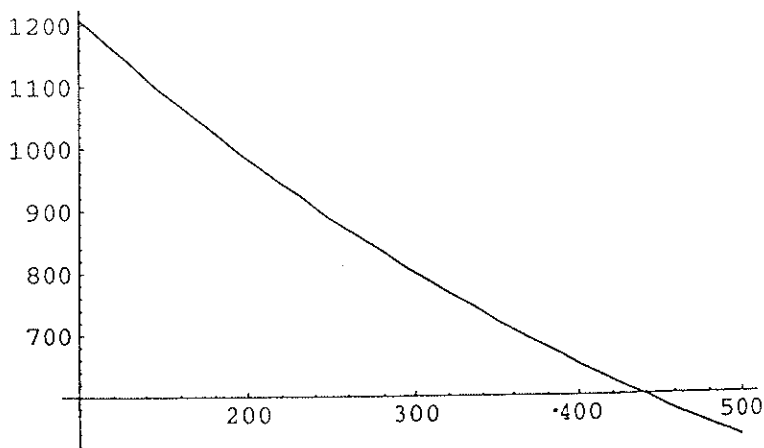
Out[608]= {1208.94, 983.249, 799.693, 650.404, 528.985}

Out[609]= {375.937, -69.7512, -787.307, -136.596, 528.985}

Out[610]= 1031.76



Out[611]= - Graphics -



Out[612]= - Graphics -

```
In[363]:= mtr = Ka (1 - Exp[-c t]) Exp[-a t - a/c Exp[-c t] + a/c]
```

```
Out[363]=  $a E^{\frac{a}{c} - \frac{a E^{-c t}}{c} - a t} (1 - E^{-c t}) K$ 
```

```
In[613]:= edata = {{100, 30}, {200, 30}, {300, 40}, {400, 35}, {500, 221}}
col1 = Column[edata, 1]
col2 = Column[edata, 2]
```

```
Out[613]= {{100, 30}, {200, 30}, {300, 40}, {400, 35}, {500, 221}}
```

```
Out[614]= {100, 200, 300, 400, 500}
```

```
Out[615]= {30, 30, 40, 35, 221}
```



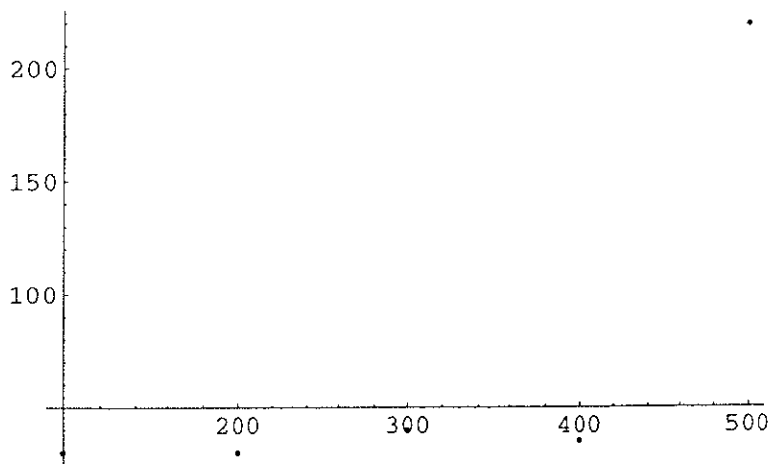
```
In[616]:= ft =
  NonlinearFit[edata, mtr, t, {{K, 510^7}, {c, 1}, {a, 210^-6}}, MaxIterations -> 100,
  PrecisionGoal -> 1, AccuracyGoal -> 1]
dmtr = ft /. t -> col1
err = dmtr - col2
rms = Sqrt[Plus@@((dmtr - col2)^2)]
ListPlot[edata]
Plot[ft, {t, 100, 500}]
```

Out[616]=  $97.1875 E^{0.000143927-0.000143927 E^{-0.0135051 t}-1.94375 \times 10^{-6} t} (1 - E^{-0.0135051 t})$

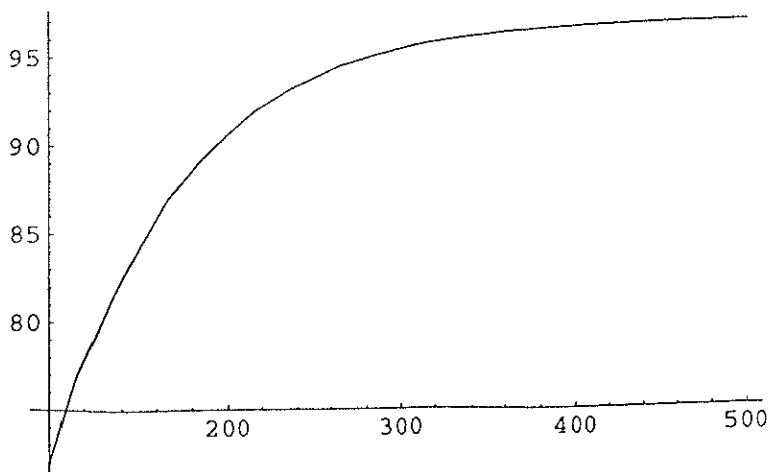
Out[617]= {71.9992, 90.6396, 95.4547, 96.6881, 96.9937}

Out[618]= {41.9992, 60.6396, 55.4547, 61.6881, -124.006}

Out[619]= 166.431



Out[620]= - Graphics -



Out[621]= - Graphics -

```
In[363]:= mtr = K a (1 - Exp[-c t]) Exp[-a t - a / c Exp[-c t] + a / c]
```

```
Out[363]=  $a E^{\frac{a}{c} - \frac{a E^{-c t}}{c} - a t} (1 - E^{-c t}) K$ 
```

```
In[622]:= edata = {{100, 6004}, {200, 7674}, {300, 18879}, {400, 6022}, {500, 5}}
           col1 = Column[edata, 1]
           col2 = Column[edata, 2]
```

```
Out[622]= {{100, 6004}, {200, 7674}, {300, 18879}, {400, 6022}, {500, 5}}
```

```
Out[623]= {100, 200, 300, 400, 500}
```

```
Out[624]= {6004, 7674, 18879, 6022, 5}
```

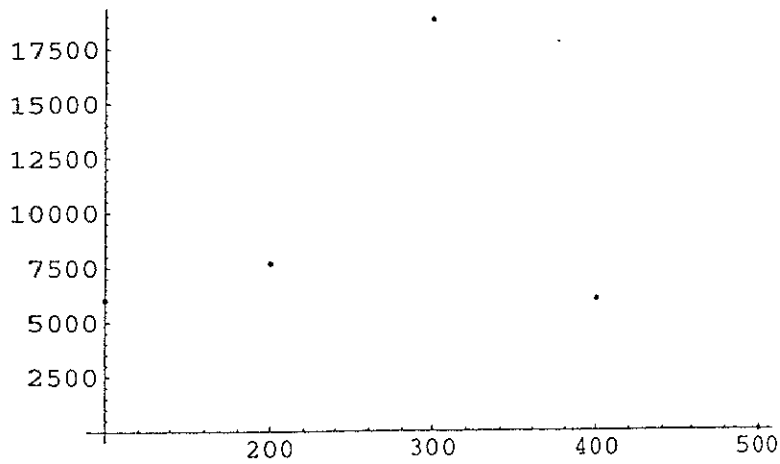
```
In[625]:= ft =
  NonlinearFit[edata, mtr, t, {{K, 3 10^8}, {c, 1}, {a, 10^-6}}, MaxIterations -> 100,
  PrecisionGoal -> 1, AccuracyGoal -> 1]
dmtr = ft /. t -> col1
err = dmtr - col2
rms = Sqrt[Plus@@((dmtr - col2)^2)]
ListPlot[edata]
Plot[ft, {t, 100, 500}]
```

Out[625]=  $7791.2 E^{9.36976 \times 10^{-10}} - 9.36976 \times 10^{-10} E^{-27734. t} - 0.0000259861 t (1 - E^{-27734. t})$

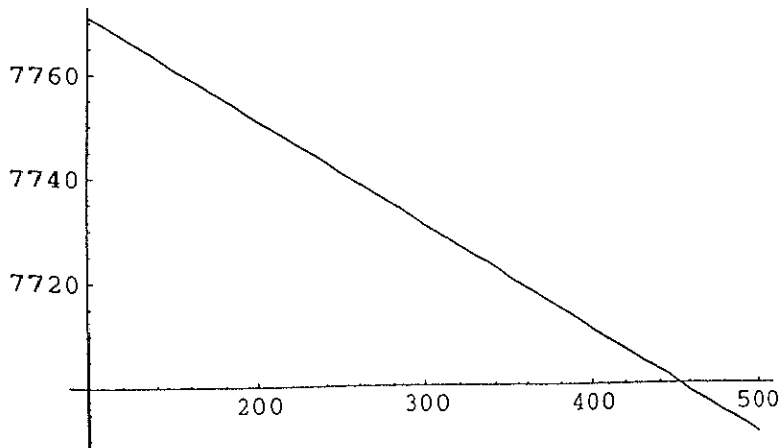
Out[626]= {7770.98, 7750.81, 7730.7, 7710.63, 7690.62}

Out[627]= {1766.98, 76.8119, -11148.3, 1688.63, 7685.62}

Out[628]= 13759.8



Out[629]= - Graphics -



Out[630]= - Graphics -

```
In[363]:= mtr = Ka (1 - Exp[-c t]) Exp[-a t - a / c Exp[-c t] + a / c]
```

```
Out[363]=  $a E^{\frac{a}{c} - \frac{a E^{-c t}}{c} - a t} (1 - E^{-c t}) K$ 
```

```
In[559]:= edata = {{100, 172}, {200, 234}, {300, 352}, {400, 164}, {500, 1573}}
          col1 = Column[edata, 1]
          col2 = Column[edata, 2]
```

```
Out[559]= {{100, 172}, {200, 234}, {300, 352}, {400, 164}, {500, 1573}}
```

```
Out[560]= {100, 200, 300, 400, 500}
```

```
Out[561]= {172, 234, 352, 164, 1573}
```

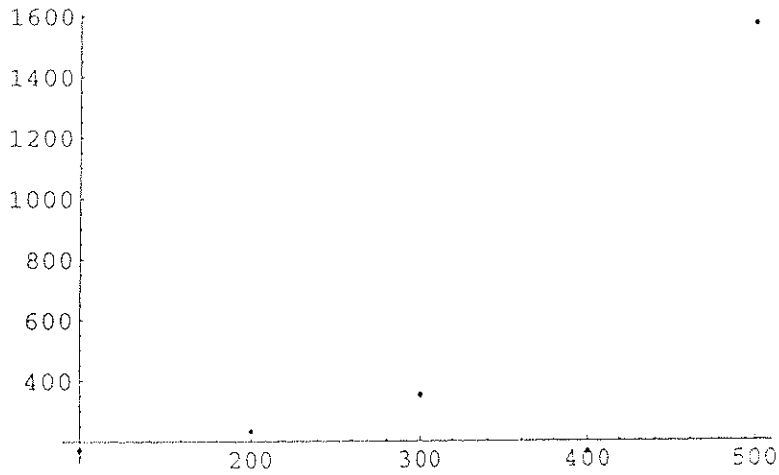
```
In[580]:= ft = NonlinearFit[edata, mtr, t,
  {{K, 2.85 10^6}, {c, 4.9 10^-4}, {a, 4.98 10^-4}}, MaxIterations -> 100,
  PrecisionGoal -> 1, AccuracyGoal -> 1]
dmtr = ft /. t -> col1
err = dmtr - col2
rms = Sqrt[Plus@@((dmtr - col2)^2)]
ListPlot[edata]
Plot[ft, {t, 100, 500}]
```

Out[580]=  $-785.125 E^{0.162882-0.162882 e^{-0.0016574 t} + 0.000269951 t} (1 - E^{0.0016574 t})$

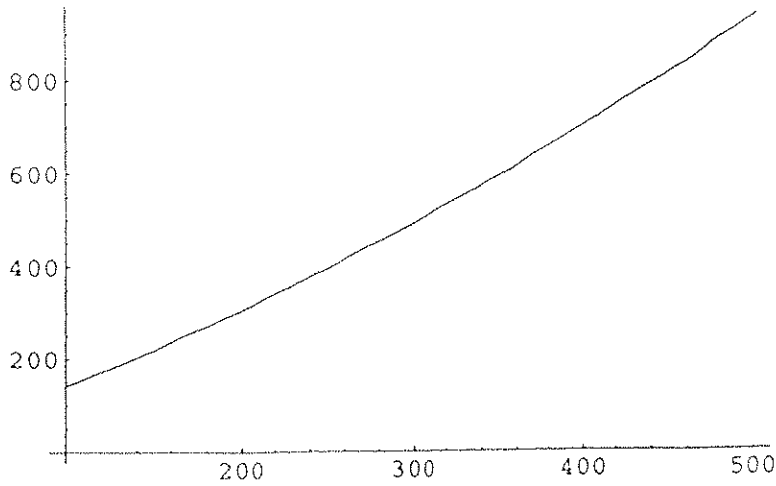
Out[581]= {141.197, 305.499, 493.776, 705.792, 939.698}

Out[582]= {-30.8027, 71.499, 141.776, 541.792, -633.302}

Out[583]= 848.983



Out[584]= - Graphics -



Out[585]= - Graphics -

```
In[363]:= mtr = Ka (1 - Exp[-c t]) Exp[-a t - a / c Exp[-c t] + a / c]
```

```
Out[363]=  $a K e^{\frac{a}{c} - \frac{a E^{-c t}}{c}} e^{-a t} (1 - E^{-c t}) K$ 
```

```
In[586]:= edata = {{100, 975}, {200, 535}, {300, 511}, {400, 534}, {500, 5330}}
           col1 = Column[edata, 1]
           col2 = Column[edata, 2]
```

```
Out[586]= {{100, 975}, {200, 535}, {300, 511}, {400, 534}, {500, 5330}}
```

```
Out[587]= {100, 200, 300, 400, 500}
```

```
Out[588]= {975, 535, 511, 534, 5330}
```

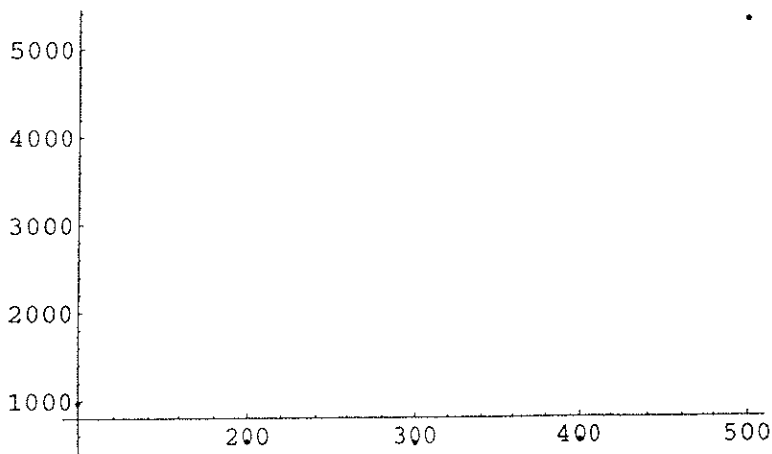
```
In[589]:= ft = NonlinearFit[edata, mtr, t,
  {{K, 2.7 10^6}, {c, 5.7 10^-4}, {a, 5.7 10^-4}}, MaxIterations -> 100,
  PrecisionGoal -> 1, AccuracyGoal -> 1]
dmtr = ft /. t -> col1
err = dmtr - col2
rms = Sqrt[Plus@@((dmtr - col2)^2)]
ListPlot[edata]
Plot[ft, {t, 100, 500}]
```

Out[589]=  $-28.3224 E^{-0.121306+0.121306 E^{0.00624078 t}-0.000757046 t} (1 - E^{0.00624078 t})$

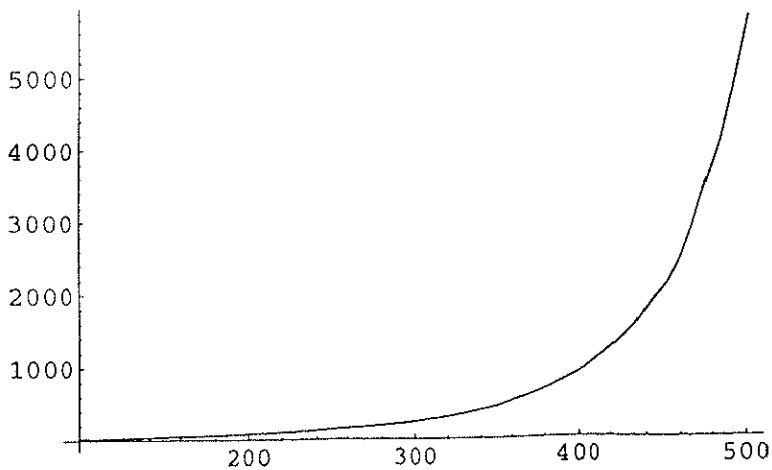
Out[590]= {25.2746, 81.7278, 242.093, 899.855, 5809.74}

Out[591]= {-949.725, -453.272, -268.907, 365.855, 479.736}

Out[592]= 1242.47



Out[593]= - Graphics -



Out[594]= - Graphics -

```

<< Statistics`DataManipulation`
<< Statistics`NonlinearFit`
<< Statistics`LinearRegression`

edata = {{0, 0}, {27, 665}, {29, 1649}, {30, 1205}, {60, 2849}, {88,
3591}, {90, 3890}, {91, 770}, {121, 4361}, {122, 272}, {152, 5327},
{173, 0}, {176, 2800}, {180, 5842}, {182, 1537}, {183, 812}, {202,
252}, {211, 25395}, {213, 1947}, {229, 363}, {244, 2725}, {247,
30489}, {272, 3322}, {275, 3126}, {295, 6500}, {303, 3973}, {321,
691}, {333, 4643}, {334, 4457}, {358, 835}, {364, 5268},
{394, 5915}, {395, 6029}, {419, 1360}, {425, 6857}, {430, 19665},
{456, 64655}, {487, 77060}, {532, 92290}, {590,
111531}, {681, 129263}, {682, 139257}, {701, 139257},
{713, 147987}, {738, 147987}, {817, 191813}, {897, 244215}, {924,
244215}, {938, 259490}, {987, 300921}, {999, 300921}, {1023, 315627}}
edata = {{0, 0}, {27, 665}, {29, 1649}, {30, -1205}, {60, 2849}, {88,
3591}, {90, 3890}, {91, 770}, {121, 4361}, {122, 272}, {152, 5327},
{173, 0}, {176, 2800}, {180, 5842}, {182, 1537}, {183, 812}, {202,
252}, {211, 25395}, {213, 1947}, {229, 363}, {244, 2725}, {247,
30489}, {272, 3322}, {275, 3126}, {295, 6500}, {303, 3973}, {321,
691}, {333, 4643}, {334, 4457}, {358, 835}, {364, 5268}, {387, 53853},
{394, 5915}, {395, 6029}, {419, 1360}, {425, 6857}, {430, 19665},
{456, 64655}, {487, 77060}, {511, 279763}, {532, 92290}, {590,
111531}, {665, 43324}, {681, 129263}, {682, 139257}, {701, 139257},
{713, 147987}, {738, 147987}, {817, 191813}, {897, 244215}, {924,
244215}, {938, 259490}, {987, 300921}, {999, 300921}, {1023, 315627}}

coll = Column[edata, 1]
coll2 = Column[edata, 2]

mtlin = 2 K at Exp[-a t^2]

{{0, 0}, {27, 665}, {29, 1649}, {30, 1205}, {60, 2849}, {88, 3591}, {90, 3890}, {91, 770},
{121, 4361}, {122, 272}, {152, 5327}, {173, 0}, {176, 2800}, {180, 5842}, {182, 1537},
{183, 812}, {202, 252}, {211, 25395}, {213, 1947}, {229, 363}, {244, 2725}, {247, 30489},
{272, 3322}, {275, 3126}, {295, 6500}, {303, 3973}, {321, 691}, {333, 4643}, {334, 4457},
{358, 835}, {364, 5268}, {394, 5915}, {395, 6029}, {419, 1360}, {425, 6857}, {430, 19665},
{456, 64655}, {487, 77060}, {532, 92290}, {590, 111531}, {681, 129263}, {682, 139257},
{701, 139257}, {713, 147987}, {738, 147987}, {817, 191813}, {897, 244215},
{924, 244215}, {938, 259490}, {987, 300921}, {999, 300921}, {1023, 315627}}

{{0, 0}, {27, 665}, {29, 1649}, {30, 1205}, {60, 2849}, {88, 3591}, {90, 3890}, {91, 770},
{121, 4361}, {122, 272}, {152, 5327}, {173, 0}, {176, 2800}, {180, 5842}, {182, 1537},
{183, 812}, {202, 252}, {211, 25395}, {213, 1947}, {229, 363}, {244, 2725}, {247, 30489},
{272, 3322}, {275, 3126}, {295, 6500}, {303, 3973}, {321, 691}, {333, 4643}, {334, 4457},
{358, 835}, {364, 5268}, {387, 53853}, {394, 5915}, {395, 6029}, {419, 1360},
{425, 6857}, {430, 19665}, {456, 64655}, {487, 77060}, {511, 279763}, {532, 92290},
{590, 111531}, {665, 43324}, {681, 129263}, {682, 139257}, {701, 139257},
{713, 147987}, {738, 147987}, {817, 191813}, {897, 244215}, {924, 244215},
{938, 259490}, {987, 300921}, {999, 300921}, {1023, 315627}}

{0, 27, 29, 30, 60, 88, 90, 91, 121, 122, 152, 173, 176, 180, 182, 183, 202, 211, 213, 229,
244, 247, 272, 275, 295, 303, 321, 333, 334, 358, 364, 387, 394, 395, 419, 425, 430,
456, 487, 511, 532, 590, 665, 681, 682, 701, 713, 738, 817, 897, 924, 938, 987, 999, 1023}

{0, 665, 1649, 1205, 2849, 3591, 3890, 770, 4361, 272, 5327, 0, 2800, 5842, 1537, 812, 252,
25395, 1947, 363, 2725, 30489, 3322, 3126, 6500, 3973, 691, 4643, 4457, 835, 5268, 53853,
5915, 6029, 1360, 6857, 19665, 64655, 77060, 279763, 92290, 111531, 43324, 129263,
139257, 139257, 147987, 147987, 191813, 244215, 244215, 259490, 300921, 300921, 315627}

2 a E^{-a t^2} K t

```



```
fx = NonlinearFit[edata, mtlin, t, {{K, 1110000}, {a, 0.00001}}, MaxIterations -> 300,
PrecisionGoal -> 1, AccuracyGoal -> 1]
```

```
dfx = fx /. t -> col1 (* data for fx is now in dfx *)
errfx = dfx - col2 (* gives error from actual at each point *)
err2fx = errfx^2 (* squares the error *)
sum2errfx = Plus @@ err2fx (* add all the list elements *)
rmsfx = Sqrt[sum2errfx] (* the final root mean square error *)
Plot[fx, {t, 0, 1100}]
ListPlot[edata]
```

30.659 E<sup>2.39621×10<sup>-6</sup></sup> t<sup>2</sup> t

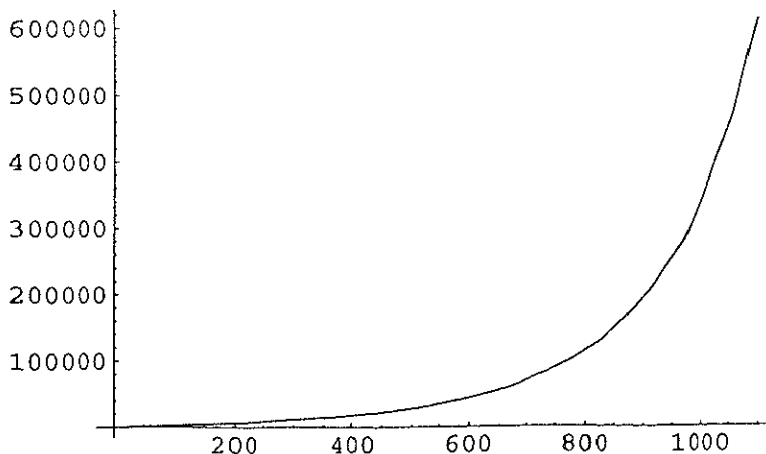
```
{0, 829.24, 890.905, 921.756, 1855.48, 2748.52, 2813.39, 2845.88, 3842.2, 3876.21,
4925.44, 5698.36, 5811.74, 5964.14, 6040.88, 6079.39, 6829.24, 7197.34,
7280.33, 7960.98, 8627.89, 8764.85, 9956.78, 10106.3, 11141.5, 11575.6,
12597.8, 13316.8, 13378.2, 14921.6, 15330., 17522.7, 17600.5, 19564.6, 20087.,
20532.6, 23009.8, 26357.2, 32136.7, 41654.7, 58828.2, 63434., 63735., 69768.1,
73907.2, 83445.6, 123996., 189093., 219139., 236798., 312358., 334736., 385047.}
```

```
{0, 164.24, -758.095, -283.244, -993.523, -842.476, -1076.61, 2075.88, -518.802,
3604.21, -401.56, 5698.36, 3011.74, 122.141, 4503.88, 5267.39, 6577.24, -18197.7,
5333.33, 7597.98, 5902.89, -21724.1, 6634.78, 6980.26, 4641.49, 7602.58, 11906.8,
8673.8, 8921.16, 14086.6, 10062., 11607.7, 11571.5, 18204.6, 13230., 867.623,
-41645.2, -50702.8, -60153.3, -69876.3, 15504.2, -65829., -75522., -69488.9,
-74079.8, -64541.4, -67816.7, -55122.5, -25075.8, -22691.6, 11437.5, 33815.2, 69420.1}
```

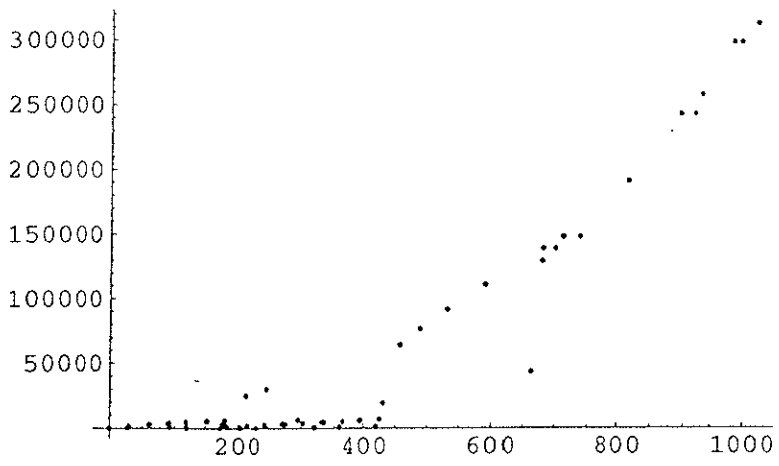
```
{0, 26974.9, 574708., 80227.2, 987087.,
709765., 1.15909×106, 4.30929×106, 269156., 1.29903×107, 161250.,
3.24713×107, 9.07058×106, 14918.5, 2.02849×107, 2.77454×107, 4.32601×107,
3.31155×108, 2.84445×107, 5.77294×107, 3.48441×107, 4.71939×108, 4.40204×107,
4.87241×107, 2.15435×107, 5.77992×107, 1.41771×108, 7.52349×107, 7.95871×107,
1.98433×108, 1.01244×108, 1.3474×108, 1.33899×108, 3.31408×108, 1.75034×108,
752770., 1.73432×109, 2.57077×109, 3.61842×109, 4.8827×109, 2.40379×108,
4.33345×109, 5.70357×109, 4.8287×109, 5.48782×109, 4.1656×109, 4.5991×109,
3.03849×109, 6.28797×108, 5.14908×108, 1.30816×108, 1.14347×109, 4.81916×109}
```

5.50629×10<sup>10</sup>

234655.



- Graphics -



- Graphics -

```

<< Statistics`DataManipulation'
<< Statistics`NonlinearFit'
<< Statistics`LinearRegression'

edata = {{0, 0}, {295, 6500}, {430, 19665}, {1023, 315627}}

{{0, 0}, {295, 6500}, {430, 19665}, {1023, 315627}}

col1 = Column[edata, 1]
col2 = Column[edata, 2]
edata = {{0, 0}, {27, 665}, {29, 1649}, {30, 1205}, {60, 2849}, {88,
3591}, {90, 3890}, {91, 770}, {121, 4361}, {122, 272}, {152, 5327},
{173, 0}, {176, 2800}, {180, 5842}, {182, 1537}, {183, 812}, {202,
252}, {211, 25395}, {213, 1947}, {229, 363}, {244, 2725}, {247,
30489}, {272, 3322}, {275, 3126}, {295, 6500}, {303, 3973}, {321,
691}, {333, 4643}, {334, 4457}, {358, 835}, {364, 5268},
{394, 5915}, {395, 6029}, {419, 1360}, {425, 6857}, {430, 19665},
{456, 64655}, {487, 77060}, {532, 92290}, {590,
111531}, {665, 43324}, {681, 129263}, {682, 139257}, {701, 139257},
{713, 147987}, {738, 147987}, {817, 191813}, {897, 244215}, {924,
244215}, {938, 259490}, {987, 300921}, {999, 300921}, {1023, 315627}}

col1 = Column[edata, 1]
col2 = Column[edata, 2]

{0, 295, 430, 1023}

{0, 6500, 19665, 315627}

{{0, 0}, {27, 665}, {29, 1649}, {30, 1205}, {60, 2849}, {88, 3591}, {90, 3890}, {91, 770},
{121, 4361}, {122, 272}, {152, 5327}, {173, 0}, {176, 2800}, {180, 5842}, {182, 1537},
{183, 812}, {202, 252}, {211, 25395}, {213, 1947}, {229, 363}, {244, 2725}, {247, 30489},
{272, 3322}, {275, 3126}, {295, 6500}, {303, 3973}, {321, 691}, {333, 4643}, {334, 4457},
{358, 835}, {364, 5268}, {394, 5915}, {395, 6029}, {419, 1360}, {425, 6857}, {430, 19665},
{456, 64655}, {487, 77060}, {532, 92290}, {590, 111531}, {665, 43324}, {681, 129263},
{682, 139257}, {701, 139257}, {713, 147987}, {738, 147987}, {817, 191813}, {897, 244215},
{924, 244215}, {938, 259490}, {987, 300921}, {999, 300921}, {1023, 315627}}

{0, 27, 29, 30, 60, 88, 90, 91, 121, 122, 152, 173, 176, 180, 182, 183, 202, 211, 213,
229, 244, 247, 272, 275, 295, 303, 321, 333, 334, 358, 364, 394, 395, 419, 425,
430, 456, 487, 532, 590, 665, 681, 682, 701, 713, 738, 817, 897, 924, 938, 987, 999, 1023}

{0, 665, 1649, 1205, 2849, 3591, 3890, 770, 4361, 272, 5327, 0, 2800, 5842, 1537, 812, 252,
25395, 1947, 363, 2725, 30489, 3322, 3126, 6500, 3973, 691, 4643, 4457, 835, 5268,
5915, 6029, 1360, 6857, 19665, 64655, 77060, 92290, 111531, 43324, 129263,
139257, 139257, 147987, 147987, 191813, 244215, 244215, 259490, 300921, 300921, 315627}

mtf = Ka (1 - Exp[-c t]) Exp[-a t - a/c Exp[-c t] + a/c]


$$a E^{\frac{a}{c}} \frac{a E^{-c t}}{c} - a t (1 - E^{-c t}) K$$


ft = NonlinearFit[edata, mtf, t,
{{K, 0.000000000000001}, {c, 0.00035}, {a, 0.001}}, MaxIterations -> 300,
PrecisionGoal -> 1, AccuracyGoal -> 1]
dmtf = ft /. t -> col1 (* data for fitted mta is now in dmta *)
err = dmtf - col2 (* gives error from actual at each point *)
rms = Sqrt[Plus@@((dmtf - col2)^2)]
Plot[ft, {t, 0, 1100}]
ListPlot[edata]

NonlinearFit::lmpnocon : Warning: The sum of squares has achieved a minimum, but
at least one parameter estimate fails to satisfy either an accuracy goal of 0
digit(s) or a precision goal of 0 digit(s). These goals are less strict than
those for the sum of squares, specified by AccuracyGoal->1 and PrecisionGoal->1.

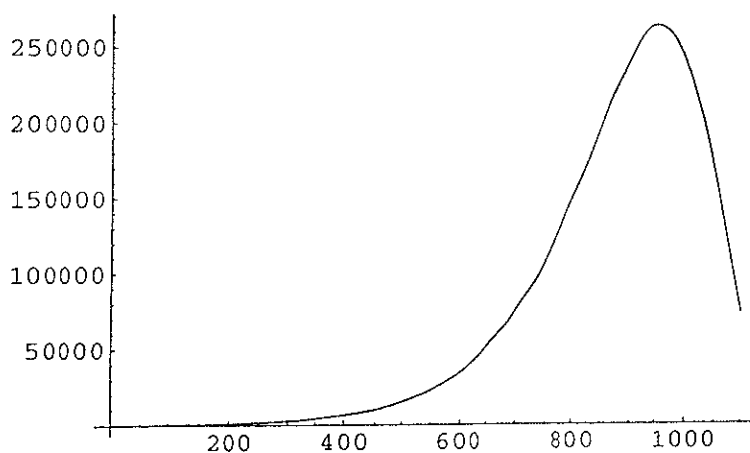
```

$$-220.389 E^{0.000306209-0.000306209 E^{0.00850519 t} + 2.60436 \times 10^{-6} t} (1 - E^{0.00850519 t})$$

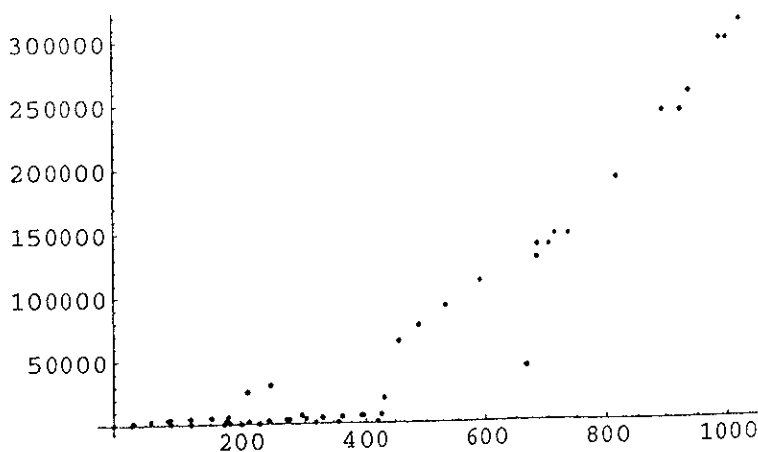
{0, 56.8923, 61.6492, 64.0582, 146.73, 245.428, 253.417, 257.463, 396.304,  
 401.569, 582.233, 739.049, 763.821, 797.847, 815.297, 824.134, 1007.1, 1104.61,  
 1127.31, 1323.43, 1533.08, 1578.3, 2003.32, 2060.63, 2482.17, 2671.76, 3148.16,  
 3508.38, 3540.07, 4386.49, 4626.14, 6023.1, 6075.98, 7486.94, 7886.01, 8234.12,  
 10296.4, 13409.3, 19588.4, 31646.6, 57659.3, 65258.5, 65761.4, 75973.6,  
 83092.1, 99671.6, 167140., 242011., 258830., 263775., 252267., 241547., 210951.}

{0, -608.108, -1587.35, -1140.94, -2702.27, -3345.57, -3636.58, -512.537, -3964.7,  
 129.569, -4744.77, 739.049, -2036.18, -5044.15, -721.703, 12.1344, 755.099, -24290.4,  
 -819.692, 960.432, -1191.92, -28910.7, -1318.68, -1065.37, -4017.83, -1301.24, 2457.16,  
 -1134.62, -916.929, 3551.49, -641.861, 108.099, 46.9763, 6126.94, 1029.01, -11430.9,  
 -54358.6, -63650.7, -72701.6, -79884.4, 14335.3, -64004.5, -73495.6, -63283.4,  
 -64894.9, -48315.4, -24672.9, -2204.01, 14614.6, 4285.42, -48654.4, -59373.6, -104676.)

241595.



- Graphics -



- Graphics -