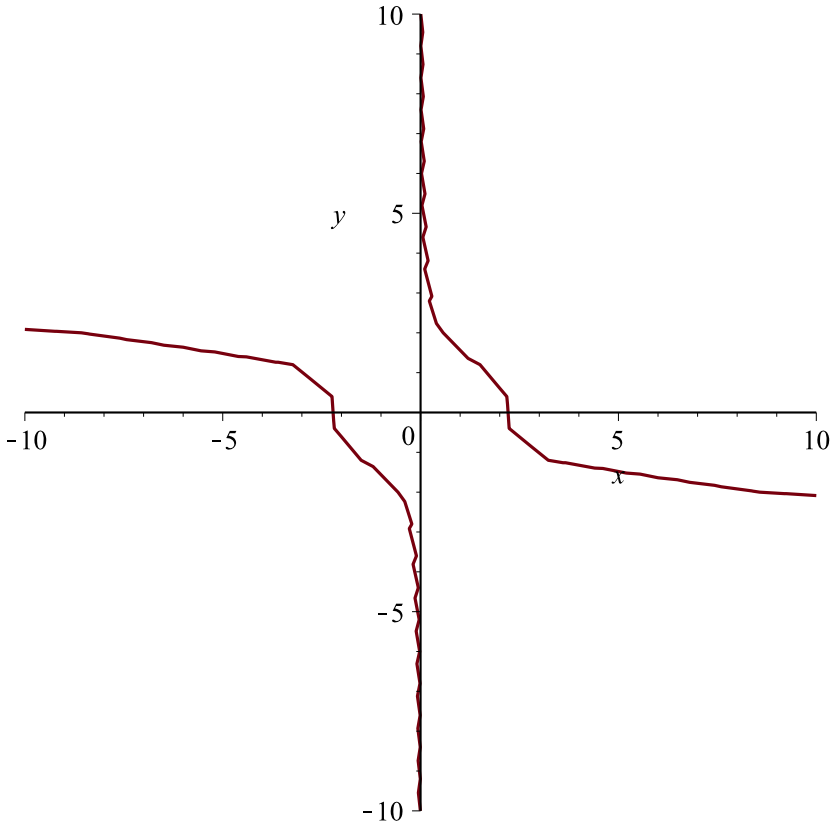
```
> with(plots):
```

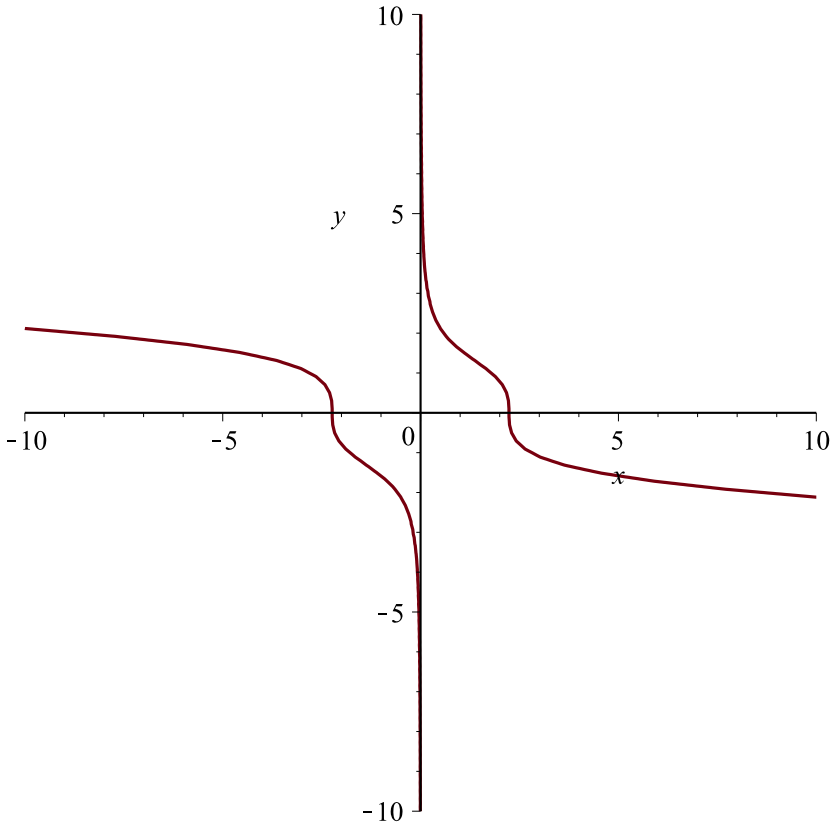
This is ugly

```
> implicitplot(x^2 + x*y^3 = 5, x = -10..10, y = -10..10);
```

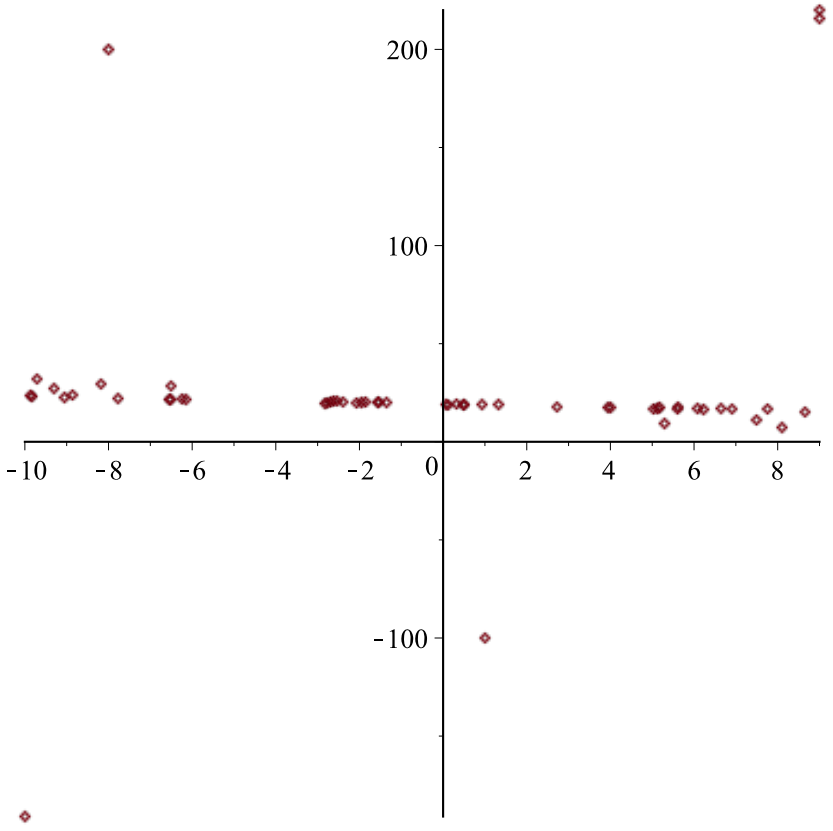


Use a finer grid to make it prettier.

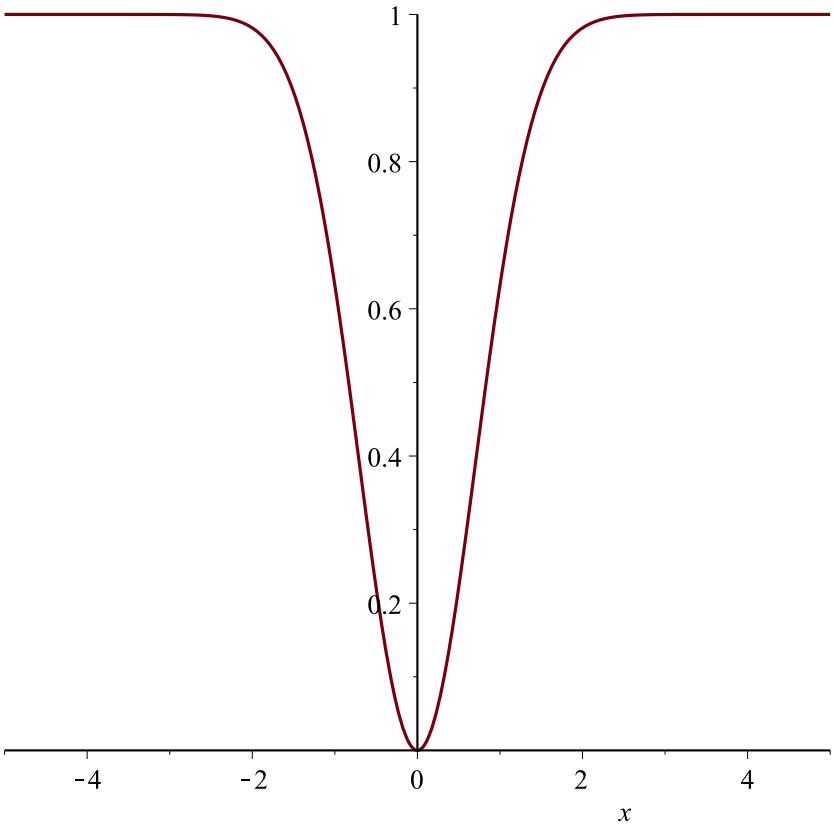
```
> implicitplot(x^2 + x*y^3 = 5, x = -10..10, y = -10..10, grid = [100, 100])
```



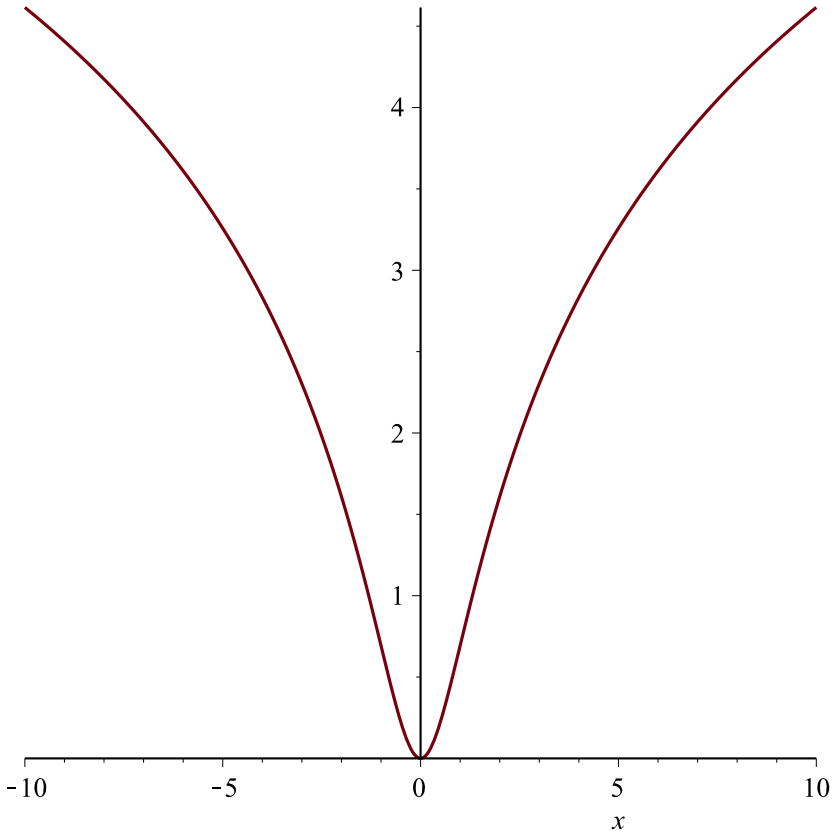

```
> ReadFromWeb := proc(URL :: string, {printfile :: truefalse := false})
  local n, m, status, webfile, headers;
  status, webfile, headers := HTTP[Get](URL) :
  if ( HTTP[Code](status) ≠ "OK") then
     error(HTTP[Code](status), URL);
  fi;
  # now read the web page
  n := 0 :
  while (n < length(webfile)) do
    m := n;
    parse(webfile, statement, lastread='n', offset=n);
    if (printfile) then printf("%s", webfile[m + 1 ..n]); fi;
  od:
 end:

> ReadFromWeb("http://www.math.sunysb.edu/~scott/mat331.spr13/problems/bdata.txt");
> plot(bdata, style=point);
```



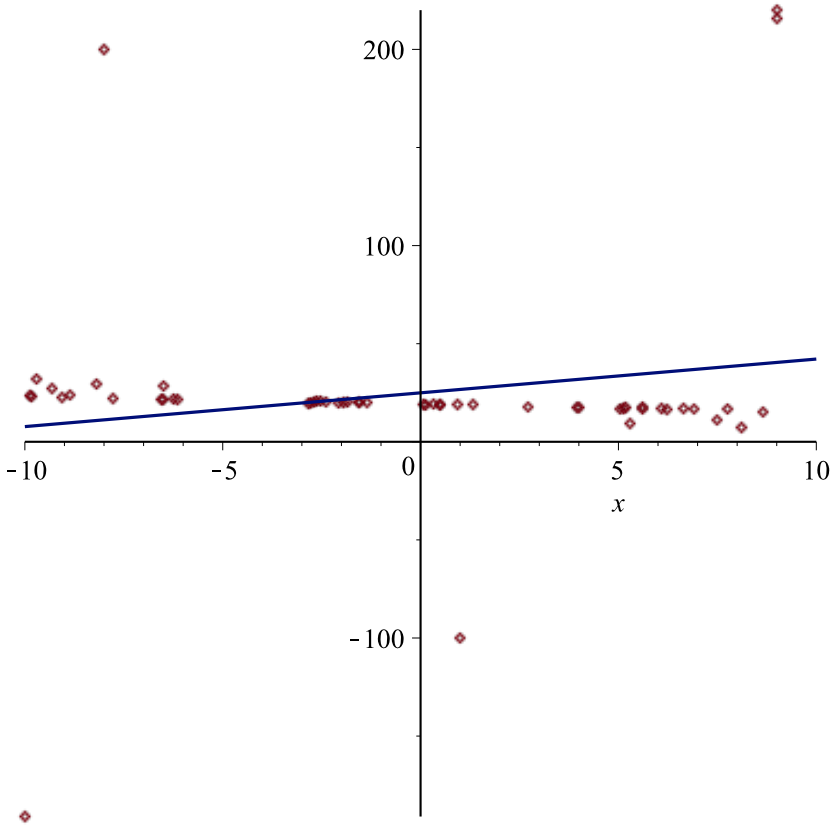

```
> plot(1-exp(-x^2), x=-5..5);
```



> $plot(\ln(1+x^2), x=-10..10);$




```
> with(CurveFitting) :
> plot([bdata, LeastSquares(bdata, x)], x = -10..10, style = [point, line]);
```




```
> ed := x -> 1 - exp(-x^2);
```

$$ed := x \to 1 - e^{-x^2} \tag{1}$$

```
> sum(i^3, i = 1..10);
```

$$3025 \tag{2}$$

Regular least squares minimizes sum squares of vertical distances.
We want to minimize sum of ed(vertical distances).

```
> eddist := (pt, m, b) -> ed(m*pt[1] + b - pt[2]);
```

$$eddist := (pt, m, b) \to ed(m\, pt_1 + b - pt_2) \tag{3}$$

```
> eddist([1, 3], 2, 4);
```

$$1 - e^{-9} \tag{4}$$

```
> sumed := (data, m, b) -> sum(eddist(data[i], m, b), i = 1..nops(data))/nops(data);
```

$$sumed := (data, m, b) \to \frac{\sum_{i=1}^{nops(data)} eddist(data_i, m, b)}{nops(data)} \tag{5}$$

```
> sumed(bdata, 2, 20); evalf(%);
```

$$0.9899696122 - \frac{1}{54}\,e^{-36481} - \frac{1}{54}\,e^{-38416} - \frac{1}{54}\,e^{-33124} - \frac{1}{54}\,e^{-14884}$$

$$0.9899696122 \tag{6}$$

```
> sumed(bdata, -2, 20); evalf(%);
```

$$0.8998828689 - \frac{1}{54}\,e^{-53361} - \frac{1}{54}\,e^{-26896} - \frac{1}{54}\,e^{-47524} - \frac{1}{54}\,e^{-13924}$$

$$0.8998828689 \tag{7}$$

want to minimize the mess below.

```
> sumed(bdata, m, b);
```

$$1 - \frac{1}{54}\,e^{-(-8m+b-200)^2} - \frac{1}{54}\,e^{-(9m+b-220)^2} - \frac{1}{54}\,e^{-(m+b+100)^2} \tag{8}$$

$$- \frac{1}{54}\,e^{-(5.295254201m+b-9.403916851)^2} - \frac{1}{54}\,e^{-(8.105629482m+b-7.166928438)^2}$$

$$- \frac{1}{54}\,e^{-(9m+b-215.6599449)^2} - \frac{1}{54}\,e^{-(-10m+b+191)^2}$$

$$- \frac{1}{54}\,e^{-(-9.710001259m+b-32.12397498)^2} - \frac{1}{54}\,e^{-(-6.499868778m+b-28.48508601)^2}$$

$$- \frac{1}{54}\,e^{-(7.492109388m+b-11.06831268)^2} - \frac{1}{54}\,e^{-(0.93254506m+b-18.90640481)^2}$$

$$- \frac{1}{54}\,e^{-(-8.184966738m+b-29.44895089)^2} - \frac{1}{54}\,e^{-(-9.307860036m+b-27.09063691)^2}$$

$$- \frac{1}{54}\,e^{-(-1.852442276m+b-20.25908204)^2} - \frac{1}{54}\,e^{-(6.90280682m+b-16.84990814)^2}$$

$$- \frac{1}{54}\,e^{-(-2.532240154m+b-20.72224765)^2} - \frac{1}{54}\,e^{-(1.32201814m+b-18.91342503)^2}$$

$$- \frac{1}{54}\,e^{-(2.71911796m+b-17.75913317)^2} - \frac{1}{54}\,e^{-(0.49583125m+b-18.89613761)^2}$$

$$- \frac{1}{54}\,e^{-(5.12446722m+b-16.91928245)^2} - \frac{1}{54}\,e^{-(-1.550062590m+b-20.21390427)^2}$$

$$- \frac{1}{54}\,e^{-(-6.143925098m+b-21.65680593)^2} - \frac{1}{54}\,e^{-(5.60762551m+b-16.84921688)^2}$$

$$- \frac{1}{54}\,e^{-(6.64081052m+b-17.04952989)^2} - \frac{1}{54}\,e^{-(4.00205027m+b-17.47005315)^2}$$

$$- \frac{1}{54}\,e^{-(5.17321040m+b-17.55005418)^2} - \frac{1}{54}\,e^{-(-2.076084772m+b-19.72089223)^2}$$

$$- \frac{1}{54}\,e^{-(-9.869721387m+b-23.70277711)^2} - \frac{1}{54}\,e^{-(-7.770840930m+b-22.16242030)^2}$$

$$- \frac{1}{54}\,e^{-(-1.948518384m+b-20.06695018)^2} - \frac{1}{54}\,e^{-(-6.514007062m+b-21.45289388)^2}$$

$$- \frac{1}{54}\,e^{-(7.76133332m+b-16.75089278)^2} - \frac{1}{54}\,e^{-(-9.054911088m+b-22.54190263)^2}$$

$$- \frac{1}{54}\,e^{-(5.03304675m+b-16.82722949)^2} - \frac{1}{54}\,e^{-(-6.543130054m+b-21.51666222)^2}$$

$$-\frac{1}{54}\,e^{-(6.08427501\,m+b-16.97527217)^2}-\frac{1}{54}\,e^{-(-6.242938578\,m+b-21.72698882)^2}$$
$$-\frac{1}{54}\,e^{-(-2.690509364\,m+b-20.36160632)^2}-\frac{1}{54}\,e^{-(-8.857403420\,m+b-23.84930474)^2}$$
$$-\frac{1}{54}\,e^{-(-2.780958614\,m+b-19.81177275)^2}-\frac{1}{54}\,e^{-(0.49220217\,m+b-18.73849995)^2}$$
$$-\frac{1}{54}\,e^{-(6.23095437\,m+b-16.43323636)^2}-\frac{1}{54}\,e^{-(5.61148003\,m+b-17.81101690)^2}$$
$$-\frac{1}{54}\,e^{-(-2.625640890\,m+b-20.88674163)^2}-\frac{1}{54}\,e^{-(3.94617018\,m+b-17.43607480)^2}$$
$$-\frac{1}{54}\,e^{-(-2.830376788\,m+b-19.63133334)^2}-\frac{1}{54}\,e^{-(-1.358328420\,m+b-20.05752868)^2}$$
$$-\frac{1}{54}\,e^{-(-1.559782888\,m+b-19.98371172)^2}-\frac{1}{54}\,e^{-(-9.827561842\,m+b-23.06848486)^2}$$
$$-\frac{1}{54}\,e^{-(0.32311207\,m+b-19.14564218)^2}-\frac{1}{54}\,e^{-(-2.391913592\,m+b-20.30217888)^2}$$
$$-\frac{1}{54}\,e^{-(8.65124763\,m+b-15.05801139)^2}-\frac{1}{54}\,e^{-(0.12218972\,m+b-18.71889232)^2}$$
$$-\frac{1}{54}\,e^{-(0.07461504\,m+b-19.08078948)^2}$$

> $eq := \{diff(sumed(bdata, m, b), m) = 0, diff(sumed(bdata, m, b), b) = 0\}$

$$eq := \left\{-\frac{1}{54}\,(-8.00410054\,m-2\,b+34.94010630)\,e^{-(4.00205027\,m+b-17.47005315)^2}-\frac{1}{54}\,(\right. \tag{9}$$
$$-10.34642080\,m-2\,b+35.10010836)\,e^{-(5.17321040\,m+b-17.55005418)^2}$$
$$-\frac{1}{54}\,(4.152169544\,m-2\,b+39.44178446)\,e^{-(-2.076084772\,m+b-19.72089223)^2}$$
$$-\frac{1}{54}\,(19.73944277\,m-2\,b+47.40555422)\,e^{-(-9.869721387\,m+b-23.70277711)^2}$$
$$-\frac{1}{54}\,(15.54168186\,m-2\,b+44.32484060)\,e^{-(-7.770840930\,m+b-22.16242030)^2}$$
$$-\frac{1}{54}\,(3.897036768\,m-2\,b+40.13390036)\,e^{-(-1.948518384\,m+b-20.06695018)^2}$$
$$-\frac{1}{54}\,(13.02801412\,m-2\,b+42.90578776)\,e^{-(-6.514007062\,m+b-21.45289388)^2}-\frac{1}{54}\,($$
$$-15.52266664\,m-2\,b+33.50178556)\,e^{-(7.76133332\,m+b-16.75089278)^2}$$
$$-\frac{1}{54}\,(18.10982218\,m-2\,b+45.08380526)\,e^{-(-9.054911088\,m+b-22.54190263)^2}-\frac{1}{54}\,($$
$$-10.06609350\,m-2\,b+33.65445898)\,e^{-(5.03304675\,m+b-16.82722949)^2}$$
$$-\frac{1}{54}\,(13.08626011\,m-2\,b+43.03332444)\,e^{-(-6.543130054\,m+b-21.51666222)^2}-\frac{1}{54}\,($$

$$
\begin{aligned}
&-12.16855002\,m-2\,b+33.95054434\big)\,e^{-(6.08427501\,m+b-16.97527217)^2}\\
&-\frac{1}{54}\,\big(12.48587716\,m-2\,b+43.45397764\big)\,e^{-(-6.242938578\,m+b-21.72698882)^2}\\
&-\frac{1}{54}\,\big(5.381018728\,m-2\,b+40.72321264\big)\,e^{-(-2.690509364\,m+b-20.36160632)^2}\\
&-\frac{1}{54}\,\big(17.71480684\,m-2\,b+47.69860948\big)\,e^{-(-8.857403420\,m+b-23.84930474)^2}\\
&-\frac{1}{54}\,\big(5.561917228\,m-2\,b+39.62354550\big)\,e^{-(-2.780958614\,m+b-19.81177275)^2}-\frac{1}{54}\,\big(\\
&-0.98440434\,m-2\,b+37.47699990\big)\,e^{-(0.49220217\,m+b-18.73849995)^2}-\frac{1}{54}\,\big(\\
&-12.46190874\,m-2\,b+32.86647272\big)\,e^{-(6.23095437\,m+b-16.43323636)^2}-\frac{1}{54}\,\big(\\
&-11.22296006\,m-2\,b+35.62203380\big)\,e^{-(5.61148003\,m+b-17.81101690)^2}\\
&-\frac{1}{54}\,\big(5.251281780\,m-2\,b+41.77348326\big)\,e^{-(-2.625640890\,m+b-20.88674163)^2}-\frac{1}{54}\,\big(\\
&-7.89234036\,m-2\,b+34.87214960\big)\,e^{-(3.94617018\,m+b-17.43607480)^2}\\
&-\frac{1}{54}\,\big(5.660753576\,m-2\,b+39.26266668\big)\,e^{-(-2.830376788\,m+b-19.63133334)^2}\\
&-\frac{1}{54}\,\big(2.716656840\,m-2\,b+40.11505736\big)\,e^{-(-1.358328420\,m+b-20.05752868)^2}\\
&-\frac{1}{54}\,\big(3.119565776\,m-2\,b+39.96742344\big)\,e^{-(-1.559782888\,m+b-19.98371172)^2}\\
&-\frac{1}{54}\,\big(19.65512368\,m-2\,b+46.13696972\big)\,e^{-(-9.827561842\,m+b-23.06848486)^2}-\frac{1}{54}\,\big(\\
&-0.64622414\,m-2\,b+38.29128436\big)\,e^{-(0.32311207\,m+b-19.14564218)^2}\\
&-\frac{1}{54}\,\big(4.783827184\,m-2\,b+40.60435776\big)\,e^{-(-2.391913592\,m+b-20.30217888)^2}-\frac{1}{54}\,\big(\\
&-17.30249526\,m-2\,b+30.11602278\big)\,e^{-(8.65124763\,m+b-15.05801139)^2}-\frac{1}{54}\,\big(\\
&-0.24437944\,m-2\,b+37.43778464\big)\,e^{-(0.12218972\,m+b-18.71889232)^2}-\frac{1}{54}\,\big(\\
&-0.14923008\,m-2\,b+38.16157896\big)\,e^{-(0.07461504\,m+b-19.08078948)^2}-\frac{1}{54}\,\big(16\,m-2\,b\\
&+400\big)\,e^{-(-8\,m+b-200)^2}-\frac{1}{54}\,\big(-18\,m-2\,b+440\big)\,e^{-(9\,m+b-220)^2}-\frac{1}{54}\,\big(-2\,m\\
&-2\,b-200\big)\,e^{-(m+b+100)^2}-\frac{1}{54}\,\big(-10.59050840\,m-2\,b\\
&+18.80783370\big)\,e^{-(5.295254201\,m+b-9.403916851)^2}-\frac{1}{54}\,\big(-16.21125896\,m-2\,b
\end{aligned}
$$

$$+14.33385688)\,e^{-(8.105629482\,m+b-7.166928438)^2}-\frac{1}{54}\,(-18\,m-2\,b$$
$$+431.3198898)\,e^{-(9\,m+b-215.6599449)^2}-\frac{1}{54}\,(20\,m-2\,b-382)\,e^{-(-10\,m+b+191)^2}$$
$$-\frac{1}{54}\,(19.42000252\,m-2\,b+64.24794996)\,e^{-(-9.710001259\,m+b-32.12397498)^2}$$
$$-\frac{1}{54}\,(12.99973756\,m-2\,b+56.97017202)\,e^{-(-6.499868778\,m+b-28.48508601)^2}-\frac{1}{54}\,($$
$$-14.98421878\,m-2\,b+22.13662536)\,e^{-(7.492109388\,m+b-11.06831268)^2}-\frac{1}{54}\,($$
$$-1.86509012\,m-2\,b+37.81280962)\,e^{-(0.93254506\,m+b-18.90640481)^2}$$
$$-\frac{1}{54}\,(16.36993348\,m-2\,b+58.89790178)\,e^{-(-8.184966738\,m+b-29.44895089)^2}$$
$$-\frac{1}{54}\,(18.61572007\,m-2\,b+54.18127382)\,e^{-(-9.307860036\,m+b-27.09063691)^2}$$
$$-\frac{1}{54}\,(3.704884552\,m-2\,b+40.51816408)\,e^{-(-1.852442276\,m+b-20.25908204)^2}-\frac{1}{54}\,($$
$$-13.80561364\,m-2\,b+33.69981628)\,e^{-(6.90280682\,m+b-16.84990814)^2}$$
$$-\frac{1}{54}\,(5.064480308\,m-2\,b+41.44449530)\,e^{-(-2.532240154\,m+b-20.72224765)^2}-\frac{1}{54}\,($$
$$-2.64403628\,m-2\,b+37.82685006)\,e^{-(1.32201814\,m+b-18.91342503)^2}-\frac{1}{54}\,($$
$$-5.43823592\,m-2\,b+35.51826634)\,e^{-(2.71911796\,m+b-17.75913317)^2}-\frac{1}{54}\,($$
$$-0.99166250\,m-2\,b+37.79227522)\,e^{-(0.49583125\,m+b-18.89613761)^2}-\frac{1}{54}\,($$
$$-10.24893444\,m-2\,b+33.83856490)\,e^{-(5.12446722\,m+b-16.91928245)^2}$$
$$-\frac{1}{54}\,(3.100125180\,m-2\,b+40.42780854)\,e^{-(-1.550062590\,m+b-20.21390427)^2}$$
$$-\frac{1}{54}\,(12.28785020\,m-2\,b+43.31361186)\,e^{-(-6.143925098\,m+b-21.65680593)^2}-\frac{1}{54}\,($$
$$-11.21525102\,m-2\,b+33.69843376)\,e^{-(5.60762551\,m+b-16.84921688)^2}-\frac{1}{54}\,($$
$$-13.28162104\,m-2\,b+34.09905978)\,e^{-(6.64081052\,m+b-17.04952989)^2}=0,\ -\frac{1}{54}\,($$
$$-3.690112194\,m+2.716656840\,b-54.48942248)\,e^{-(-1.358328420\,m+b-20.05752868)^2}$$
$$-\frac{1}{54}\,(-4.865845316\,m+3.119565776\,b$$
$$-62.34050316)\,e^{-(-1.559782888\,m+b-19.98371172)^2}-\frac{1}{54}\,(-193.1619435\,m$$

$$+ 19.65512368\, b - 453.4139232)\, e^{-(-9.827561842\, m + b - 23.06848486)^2} - \frac{1}{54}\, ($$

$$-0.2088028196\, m - 0.64622414\, b + 12.37237615)\, e^{-(0.32311207\, m + b - 19.14564218)^2}$$

$$- \frac{1}{54}\, (-11.44250126\, m + 4.783827184\, b$$

$$- 97.12211522)\, e^{-(-2.391913592\, m + b - 20.30217888)^2} - \frac{1}{54}\, (-149.6881711\, m$$

$$- 17.30249526\, b + 260.5411708)\, e^{-(8.65124763\, m + b - 15.05801139)^2} - \frac{1}{54}\, ($$

$$-0.02986065534\, m - 0.24437944\, b + 4.574512422)\, e^{-(0.12218972\, m + b - 18.71889232)^2}$$

$$- \frac{1}{54}\, (-0.01113480839\, m - 0.14923008\, b$$

$$+ 2.847427740)\, e^{-(0.07461504\, m + b - 19.08078948)^2} - \frac{1}{54}\, (-188.5682489\, m$$

$$+ 19.42000252\, b - 623.8476750)\, e^{-(-9.710001259\, m + b - 32.12397498)^2} - \frac{1}{54}\, ($$

$$-84.49658826\, m + 12.99973756\, b - 370.2986424)\, e^{-(-6.499868778\, m + b - 28.48508601)^2}$$

$$- \frac{1}{54}\, (-112.2634062\, m - 14.98421878\, b$$

$$+ 165.8500187)\, e^{-(7.492109388\, m + b - 11.06831268)^2} - \frac{1}{54}\, (-1.739280578\, m$$

$$- 1.86509012\, b + 35.26214882)\, e^{-(0.93254506\, m + b - 18.90640481)^2} - \frac{1}{54}\, (-133.9873610\, m$$

$$+ 16.36993348\, b - 482.0773670)\, e^{-(-8.184966738\, m + b - 29.44895089)^2} - \frac{1}{54}\, ($$

$$-173.2725169\, m + 18.61572007\, b - 504.3117132)\, e^{-(-9.307860036\, m + b - 27.09063691)^2}$$

$$- \frac{1}{54}\, (-6.863084772\, m + 3.704884552\, b$$

$$- 75.05756008)\, e^{-(-1.852442276\, m + b - 20.25908204)^2} - \frac{1}{54}\, (-95.29748398\, m$$

$$- 13.80561364\, b + 232.6233216)\, e^{-(6.90280682\, m + b - 16.84990814)^2} - \frac{1}{54}\, ($$

$$-12.82448040\, m + 5.064480308\, b - 104.9474152)\, e^{-(-2.532240154\, m + b - 20.72224765)^2}$$

$$- \frac{1}{54}\, (-3.495463924\, m - 2.64403628\, b + 50.00778196)\, e^{-(1.32201814\, m + b - 18.91342503)^2}$$

$$- \frac{1}{54}\, (-14.78720496\, m - 5.43823592\, b + 96.57835592)\, e^{-(2.71911796\, m + b - 17.75913317)^2}$$

$$- \frac{1}{54}\, (-0.4916972570\, m - 0.99166250\, b$$

$$+ 18.73859106\,)\,e^{-(0.49583125\,m+b-18.89613761)^2} - \frac{1}{54}\,(-52.52032858\,m$$

$$- 10.24893444\,b + 173.4046166\,)\,e^{-(5.12446722\,m+b-16.91928245)^2} - \frac{1}{54}\,($$

$$-4.805388066\,m + 3.100125180\,b - 62.66563362\,)\,e^{-(-1.550062590\,m+b-20.21390427)^2}$$

$$- \frac{1}{54}\,(-75.49563122\,m + 12.28785020\,b$$

$$- 266.1155870\,)\,e^{-(-6.143925098\,m+b-21.65680593)^2} - \frac{1}{54}\,(-62.89092772\,m$$

$$- 11.21525102\,b + 188.9681968\,)\,e^{-(5.60762551\,m+b-16.84921688)^2} - \frac{1}{54}\,($$

$$-88.20072872\,m - 13.28162104\,b + 226.4453950\,)\,e^{-(6.64081052\,m+b-17.04952989)^2}$$

$$- \frac{1}{54}\,(-32.03281272\,m - 8.00410054\,b + 139.8320619\,)\,e^{-(4.00205027\,m+b-17.47005315)^2}$$

$$- \frac{1}{54}\,(-53.52421168\,m - 10.34642080\,b$$

$$+ 181.5802456\,)\,e^{-(5.17321040\,m+b-17.55005418)^2} - \frac{1}{54}\,(-8.620255962\,m$$

$$+ 4.152169544\,b - 81.88448810\,)\,e^{-(-2.076084772\,m+b-19.72089223)^2} - \frac{1}{54}\,($$

$$-194.8228005\,m + 19.73944277\,b - 467.8796124\,)\,e^{-(-9.869721387\,m+b-23.70277711)^2}$$

$$- \frac{1}{54}\,(-120.7719375\,m + 15.54168186\,b$$

$$- 344.4412856\,)\,e^{-(-7.770840930\,m+b-22.16242030)^2} - \frac{1}{54}\,(-7.593447786\,m$$

$$+ 3.897036768\,b - 78.20164268\,)\,e^{-(-1.948518384\,m+b-20.06695018)^2} - \frac{1}{54}\,($$

$$-84.86457600\,m + 13.02801412\,b - 279.4886044\,)\,e^{-(-6.514007062\,m+b-21.45289388)^2}$$

$$- \frac{1}{54}\,(-120.4765898\,m - 15.52266664\,b$$

$$+ 260.0185246\,)\,e^{-(7.76133332\,m+b-16.75089278)^2} - \frac{1}{54}\,(-163.9828296\,m$$

$$+ 18.10982218\,b - 408.2298482\,)\,e^{-(-9.054911088\,m+b-22.54190263)^2} - \frac{1}{54}\,($$

$$-50.66311918\,m - 10.06609350\,b + 169.3844654\,)\,e^{-(5.03304675\,m+b-16.82722949)^2}$$

$$- \frac{1}{54}\,(-85.62510180\,m + 13.08626011\,b$$

$$- 281.5726384\,)\,e^{-(-6.543130054\,m+b-21.51666222)^2} - \frac{1}{54}\,(-74.03680480\,m$$

$$-12.16855002\,b+206.5644486\Big)\,e^{-(6.08427501\,m+b-16.97527217)^2}-\frac{1}{54}\,\Big($$

$$-77.94856418\,m+12.48587716\,b-271.2805134\Big)\,e^{-(-6.242938578\,m+b-21.72698882)^2}$$

$$-\frac{1}{54}\,\Big(-14.47768128\,m+5.381018728\,b$$

$$-109.5661849\Big)\,e^{-(-2.690509364\,m+b-20.36160632)^2}-\frac{1}{54}\,\Big(-156.9071907\,m$$

$$+17.71480684\,b-422.4858268\Big)\,e^{-(-8.857403420\,m+b-23.84930474)^2}-\frac{1}{54}\,\Big($$

$$-15.46746163\,m+5.561917228\,b-110.1914402\Big)\,e^{-(-2.780958614\,m+b-19.81177275)^2}$$

$$-\frac{1}{54}\,\Big(-0.4845259524\,m-0.98440434\,b$$

$$+18.44626068\Big)\,e^{-(0.49220217\,m+b-18.73849995)^2}-\frac{1}{54}\,\Big(-77.64958472\,m$$

$$-12.46190874\,b+204.7894918\Big)\,e^{-(6.23095437\,m+b-16.43323636)^2}-\frac{1}{54}\,\Big($$

$$-62.97741626\,m-11.22296006\,b+199.8923313\Big)\,e^{-(5.61148003\,m+b-17.81101690)^2}$$

$$-\frac{1}{54}\,\Big(-13.78798017\,m+5.251281780\,b$$

$$-109.6821658\Big)\,e^{-(-2.625640890\,m+b-20.88674163)^2}-\frac{1}{54}\,\Big(-31.14451818\,m$$

$$-7.89234036\,b+137.6114369\Big)\,e^{-(3.94617018\,m+b-17.43607480)^2}-\frac{1}{54}\,\Big(-16.02206552\,m$$

$$+5.660753576\,b-111.1281404\Big)\,e^{-(-2.830376788\,m+b-19.63133334)^2}-\frac{1}{54}\,\Big(-128\,m$$

$$+16\,b-3200\Big)\,e^{-(-8\,m+b-200)^2}-\frac{1}{54}\,\Big(-162\,m-18\,b+3960\Big)\,e^{-(9\,m+b-220)^2}$$

$$-\frac{1}{54}\,\Big(-56.07943410\,m-10.59050840\,b$$

$$+99.59226042\Big)\,e^{-(5.295254201\,m+b-9.403916851)^2}-\frac{1}{54}\,\Big(-131.4024586\,m$$

$$-16.21125896\,b+116.1849329\Big)\,e^{-(8.105629482\,m+b-7.166928438)^2}-\frac{1}{54}\,\Big(-162\,m-18\,b$$

$$+3881.879008\Big)\,e^{-(9\,m+b-215.6599449)^2}-\frac{1}{54}\,\Big(-200\,m+20\,b$$

$$+3820\Big)\,e^{-(-10\,m+b+191)^2}-\frac{1}{54}\,\Big(-2\,m-2\,b-200\Big)\,e^{-(m+b+100)^2}=0\Bigg\}$$

```
> solve(eq, {m, b});
```

Warning, solutions may have been lost

now we sad.

Try ed's brother ed.

```
> ed := x -> ln(1+x^2);
```

$$ed := x \to \ln(1 + x^2) \tag{10}$$

```
> sumed(bdata,-2,20); evalf(%);
```

$$3.236740004 + \frac{1}{54}\ln(53362) + \frac{1}{54}\ln(26897) + \frac{1}{54}\ln(47525) + \frac{1}{54}\ln(13925)$$

$$4.003315493 \tag{11}$$

```
> eq2 := {diff(sumed(bdata,m,b),m)=0, diff(sumed(bdata,m,b),b)=0}
```

$$eq2 := \left\{ \frac{1}{54}\,\frac{-20\,m+2\,b+382}{1+(-10\,m+b+191)^2} + \frac{1}{54}\,\frac{-16\,m+2\,b-400}{1+(-8\,m+b-200)^2} \right. \tag{12}$$

$$+ \frac{1}{54}\,\frac{18\,m+2\,b-440}{1+(9\,m+b-220)^2} + \frac{1}{54}\,\frac{2\,m+2\,b+200}{1+(m+b+100)^2}$$

$$+ \frac{1}{54}\,\frac{1.86509012\,m+2\,b-37.81280962}{1+(0.93254506\,m+b-18.90640481)^2}$$

$$+ \frac{1}{54}\,\frac{-16.36993348\,m+2\,b-58.89790178}{1+(-8.184966738\,m+b-29.44895089)^2}$$

$$+ \frac{1}{54}\,\frac{-18.61572007\,m+2\,b-54.18127382}{1+(-9.307860036\,m+b-27.09063691)^2}$$

$$+ \frac{1}{54}\,\frac{-19.42000252\,m+2\,b-64.24794996}{1+(-9.710001259\,m+b-32.12397498)^2}$$

$$+ \frac{1}{54}\,\frac{-12.99973756\,m+2\,b-56.97017202}{1+(-6.499868778\,m+b-28.48508601)^2}$$

$$+ \frac{1}{54}\,\frac{14.98421878\,m+2\,b-22.13662536}{1+(7.492109388\,m+b-11.06831268)^2}$$

$$+ \frac{1}{54}\,\frac{10.59050840\,m+2\,b-18.80783370}{1+(5.295254201\,m+b-9.403916851)^2}$$

$$+ \frac{1}{54}\,\frac{16.21125896\,m+2\,b-14.33385688}{1+(8.105629482\,m+b-7.166928438)^2}$$

$$+ \frac{1}{54}\,\frac{18\,m+2\,b-431.3198898}{1+(9\,m+b-215.6599449)^2}$$

$$+ \frac{1}{54}\,\frac{-12.28785020\,m+2\,b-43.31361186}{1+(-6.143925098\,m+b-21.65680593)^2}$$

$$+ \frac{1}{54}\,\frac{11.21525102\,m+2\,b-33.69843376}{1+(5.60762551\,m+b-16.84921688)^2}$$

$$+ \frac{1}{54}\,\frac{13.28162104\,m+2\,b-34.09905978}{1+(6.64081052\,m+b-17.04952989)^2}$$

$$+ \frac{1}{54}\,\frac{5.43823592\,m+2\,b-35.51826634}{1+(2.71911796\,m+b-17.75913317)^2}$$

$$\left. + \frac{1}{54}\,\frac{0.99166250\,m+2\,b-37.79227522}{1+(0.49583125\,m+b-18.89613761)^2} \right.$$

$$+\frac{1}{54}\,\frac{10.24893444\,m+2\,b-33.83856490}{1+(5.12446722\,m+b-16.91928245)^2}$$
$$+\frac{1}{54}\,\frac{-3.704884552\,m+2\,b-40.51816408}{1+(-1.852442276\,m+b-20.25908204)^2}$$
$$+\frac{1}{54}\,\frac{13.80561364\,m+2\,b-33.69981628}{1+(6.90280682\,m+b-16.84990814)^2}$$
$$+\frac{1}{54}\,\frac{-5.064480308\,m+2\,b-41.44449530}{1+(-2.532240154\,m+b-20.72224765)^2}$$
$$+\frac{1}{54}\,\frac{2.64403628\,m+2\,b-37.82685006}{1+(1.32201814\,m+b-18.91342503)^2}$$
$$+\frac{1}{54}\,\frac{-18.10982218\,m+2\,b-45.08380526}{1+(-9.054911088\,m+b-22.54190263)^2}$$
$$+\frac{1}{54}\,\frac{10.06609350\,m+2\,b-33.65445898}{1+(5.03304675\,m+b-16.82722949)^2}$$
$$+\frac{1}{54}\,\frac{-19.73944277\,m+2\,b-47.40555422}{1+(-9.869721387\,m+b-23.70277711)^2}$$
$$+\frac{1}{54}\,\frac{-15.54168186\,m+2\,b-44.32484060}{1+(-7.770840930\,m+b-22.16242030)^2}$$
$$+\frac{1}{54}\,\frac{-3.897036768\,m+2\,b-40.13390036}{1+(-1.948518384\,m+b-20.06695018)^2}$$
$$+\frac{1}{54}\,\frac{8.00410054\,m+2\,b-34.94010630}{1+(4.00205027\,m+b-17.47005315)^2}$$
$$+\frac{1}{54}\,\frac{10.34642080\,m+2\,b-35.10010836}{1+(5.17321040\,m+b-17.55005418)^2}$$
$$+\frac{1}{54}\,\frac{-4.152169544\,m+2\,b-39.44178446}{1+(-2.076084772\,m+b-19.72089223)^2}$$
$$+\frac{1}{54}\,\frac{-3.100125180\,m+2\,b-40.42780854}{1+(-1.550062590\,m+b-20.21390427)^2}$$
$$+\frac{1}{54}\,\frac{-5.381018728\,m+2\,b-40.72321264}{1+(-2.690509364\,m+b-20.36160632)^2}$$
$$+\frac{1}{54}\,\frac{-17.71480684\,m+2\,b-47.69860948}{1+(-8.857403420\,m+b-23.84930474)^2}$$
$$+\frac{1}{54}\,\frac{-5.561917228\,m+2\,b-39.62354550}{1+(-2.780958614\,m+b-19.81177275)^2}$$
$$+\frac{1}{54}\,\frac{0.98440434\,m+2\,b-37.47699990}{1+(0.49220217\,m+b-18.73849995)^2}$$
$$+\frac{1}{54}\,\frac{-13.08626011\,m+2\,b-43.03332444}{1+(-6.543130054\,m+b-21.51666222)^2}$$
$$+\frac{1}{54}\,\frac{12.16855002\,m+2\,b-33.95054434}{1+(6.08427501\,m+b-16.97527217)^2}$$

$$+\frac{1}{54}\,\frac{-12.48587716\,m+2\,b-43.45397764}{1+(-6.242938578\,m+b-21.72698882)^2}$$
$$+\frac{1}{54}\,\frac{-13.02801412\,m+2\,b-42.90578776}{1+(-6.514007062\,m+b-21.45289388)^2}$$
$$+\frac{1}{54}\,\frac{15.52266664\,m+2\,b-33.50178556}{1+(7.76133332\,m+b-16.75089278)^2}$$
$$+\frac{1}{54}\,\frac{-3.119565776\,m+2\,b-39.96742344}{1+(-1.559782888\,m+b-19.98371172)^2}$$
$$+\frac{1}{54}\,\frac{-19.65512368\,m+2\,b-46.13696972}{1+(-9.827561842\,m+b-23.06848486)^2}$$
$$+\frac{1}{54}\,\frac{0.64622414\,m+2\,b-38.29128436}{1+(0.32311207\,m+b-19.14564218)^2}$$
$$+\frac{1}{54}\,\frac{-4.783827184\,m+2\,b-40.60435776}{1+(-2.391913592\,m+b-20.30217888)^2}$$
$$+\frac{1}{54}\,\frac{7.89234036\,m+2\,b-34.87214960}{1+(3.94617018\,m+b-17.43607480)^2}$$
$$+\frac{1}{54}\,\frac{-5.660753576\,m+2\,b-39.26266668}{1+(-2.830376788\,m+b-19.63133334)^2}$$
$$+\frac{1}{54}\,\frac{-2.716656840\,m+2\,b-40.11505736}{1+(-1.358328420\,m+b-20.05752868)^2}$$
$$+\frac{1}{54}\,\frac{12.46190874\,m+2\,b-32.86647272}{1+(6.23095437\,m+b-16.43323636)^2}$$
$$+\frac{1}{54}\,\frac{11.22296006\,m+2\,b-35.62203380}{1+(5.61148003\,m+b-17.81101690)^2}$$
$$+\frac{1}{54}\,\frac{-5.251281780\,m+2\,b-41.77348326}{1+(-2.625640890\,m+b-20.88674163)^2}$$
$$+\frac{1}{54}\,\frac{17.30249526\,m+2\,b-30.11602278}{1+(8.65124763\,m+b-15.05801139)^2}$$
$$+\frac{1}{54}\,\frac{0.24437944\,m+2\,b-37.43778464}{1+(0.12218972\,m+b-18.71889232)^2}$$
$$+\frac{1}{54}\,\frac{0.14923008\,m+2\,b-38.16157896}{1+(0.07461504\,m+b-19.08078948)^2}=0,\ \frac{1}{54}\,\frac{2\,m+2\,b+200}{1+(m+b+100)^2}$$
$$+\frac{1}{54}\,\frac{200\,m-20\,b-3820}{1+(-10\,m+b+191)^2}+\frac{1}{54}\,\frac{128\,m-16\,b+3200}{1+(-8\,m+b-200)^2}$$
$$+\frac{1}{54}\,\frac{162\,m+18\,b-3960}{1+(9\,m+b-220)^2}+\frac{1}{54}\,\frac{1.739280578\,m+1.86509012\,b-35.26214882}{1+(0.93254506\,m+b-18.90640481)^2}$$
$$+\frac{1}{54}\,\frac{133.9873610\,m-16.36993348\,b+482.0773670}{1+(-8.184966738\,m+b-29.44895089)^2}$$
$$+\frac{1}{54}\,\frac{173.2725169\,m-18.61572007\,b+504.3117132}{1+(-9.307860036\,m+b-27.09063691)^2}$$

$$
\begin{aligned}
&+\frac{1}{54}\,\frac{188.5682489\,m-19.42000252\,b+623.8476750}{1+(-9.710001259\,m+b-32.12397498)^2}\\
&+\frac{1}{54}\,\frac{84.49658826\,m-12.99973756\,b+370.2986424}{1+(-6.499868778\,m+b-28.48508601)^2}\\
&+\frac{1}{54}\,\frac{112.2634062\,m+14.98421878\,b-165.8500187}{1+(7.492109388\,m+b-11.06831268)^2}\\
&+\frac{1}{54}\,\frac{56.07943410\,m+10.59050840\,b-99.59226042}{1+(5.295254201\,m+b-9.403916851)^2}\\
&+\frac{1}{54}\,\frac{131.4024586\,m+16.21125896\,b-116.1849329}{1+(8.105629482\,m+b-7.166928438)^2}\\
&+\frac{1}{54}\,\frac{162\,m+18\,b-3881.879008}{1+(9\,m+b-215.6599449)^2}\\
&+\frac{1}{54}\,\frac{75.49563122\,m-12.28785020\,b+266.1155870}{1+(-6.143925098\,m+b-21.65680593)^2}\\
&+\frac{1}{54}\,\frac{62.89092772\,m+11.21525102\,b-188.9681968}{1+(5.60762551\,m+b-16.84921688)^2}\\
&+\frac{1}{54}\,\frac{88.20072872\,m+13.28162104\,b-226.4453950}{1+(6.64081052\,m+b-17.04952989)^2}\\
&+\frac{1}{54}\,\frac{14.78720496\,m+5.43823592\,b-96.57835592}{1+(2.71911796\,m+b-17.75913317)^2}\\
&+\frac{1}{54}\,\frac{0.4916972570\,m+0.99166250\,b-18.73859106}{1+(0.49583125\,m+b-18.89613761)^2}\\
&+\frac{1}{54}\,\frac{52.52032858\,m+10.24893444\,b-173.4046166}{1+(5.12446722\,m+b-16.91928245)^2}\\
&+\frac{1}{54}\,\frac{6.863084772\,m-3.704884552\,b+75.05756008}{1+(-1.852442276\,m+b-20.25908204)^2}\\
&+\frac{1}{54}\,\frac{95.29748398\,m+13.80561364\,b-232.6233216}{1+(6.90280682\,m+b-16.84990814)^2}\\
&+\frac{1}{54}\,\frac{12.82448040\,m-5.064480308\,b+104.9474152}{1+(-2.532240154\,m+b-20.72224765)^2}\\
&+\frac{1}{54}\,\frac{3.495463924\,m+2.64403628\,b-50.00778196}{1+(1.32201814\,m+b-18.91342503)^2}\\
&+\frac{1}{54}\,\frac{163.9828296\,m-18.10982218\,b+408.2298482}{1+(-9.054911088\,m+b-22.54190263)^2}\\
&+\frac{1}{54}\,\frac{50.66311918\,m+10.06609350\,b-169.3844654}{1+(5.03304675\,m+b-16.82722949)^2}\\
&+\frac{1}{54}\,\frac{194.8228005\,m-19.73944277\,b+467.8796124}{1+(-9.869721387\,m+b-23.70277711)^2}\\
&+\frac{1}{54}\,\frac{120.7719375\,m-15.54168186\,b+344.4412856}{1+(-7.770840930\,m+b-22.16242030)^2}
\end{aligned}
$$

$$
\begin{aligned}
&+\frac{1}{54}\,\frac{7.593447786\,m-3.897036768\,b+78.20164268}{1+(-1.948518384\,m+b-20.06695018)^2}\\
&+\frac{1}{54}\,\frac{32.03281272\,m+8.00410054\,b-139.8320619}{1+(4.00205027\,m+b-17.47005315)^2}\\
&+\frac{1}{54}\,\frac{53.52421168\,m+10.34642080\,b-181.5802456}{1+(5.17321040\,m+b-17.55005418)^2}\\
&+\frac{1}{54}\,\frac{8.620255962\,m-4.152169544\,b+81.88448810}{1+(-2.076084772\,m+b-19.72089223)^2}\\
&+\frac{1}{54}\,\frac{4.805388066\,m-3.100125180\,b+62.66563362}{1+(-1.550062590\,m+b-20.21390427)^2}\\
&+\frac{1}{54}\,\frac{14.47768128\,m-5.381018728\,b+109.5661849}{1+(-2.690509364\,m+b-20.36160632)^2}\\
&+\frac{1}{54}\,\frac{156.9071907\,m-17.71480684\,b+422.4858268}{1+(-8.857403420\,m+b-23.84930474)^2}\\
&+\frac{1}{54}\,\frac{15.46746163\,m-5.561917228\,b+110.1914402}{1+(-2.780958614\,m+b-19.81177275)^2}\\
&+\frac{1}{54}\,\frac{0.4845259524\,m+0.98440434\,b-18.44626068}{1+(0.49220217\,m+b-18.73849995)^2}\\
&+\frac{1}{54}\,\frac{85.62510180\,m-13.08626011\,b+281.5726384}{1+(-6.543130054\,m+b-21.51666222)^2}\\
&+\frac{1}{54}\,\frac{74.03680480\,m+12.16855002\,b-206.5644486}{1+(6.08427501\,m+b-16.97527217)^2}\\
&+\frac{1}{54}\,\frac{77.94856418\,m-12.48587716\,b+271.2805134}{1+(-6.242938578\,m+b-21.72698882)^2}\\
&+\frac{1}{54}\,\frac{84.86457600\,m-13.02801412\,b+279.4886044}{1+(-6.514007062\,m+b-21.45289388)^2}\\
&+\frac{1}{54}\,\frac{120.4765898\,m+15.52266664\,b-260.0185246}{1+(7.76133332\,m+b-16.75089278)^2}\\
&+\frac{1}{54}\,\frac{4.865845316\,m-3.119565776\,b+62.34050316}{1+(-1.559782888\,m+b-19.98371172)^2}\\
&+\frac{1}{54}\,\frac{193.1619435\,m-19.65512368\,b+453.4139232}{1+(-9.827561842\,m+b-23.06848486)^2}\\
&+\frac{1}{54}\,\frac{0.2088028196\,m+0.64622414\,b-12.37237615}{1+(0.32311207\,m+b-19.14564218)^2}\\
&+\frac{1}{54}\,\frac{11.44250126\,m-4.783827184\,b+97.12211522}{1+(-2.391913592\,m+b-20.30217888)^2}\\
&+\frac{1}{54}\,\frac{31.14451818\,m+7.89234036\,b-137.6114369}{1+(3.94617018\,m+b-17.43607480)^2}\\
&+\frac{1}{54}\,\frac{16.02206552\,m-5.660753576\,b+111.1281404}{1+(-2.830376788\,m+b-19.63133334)^2}
\end{aligned}
$$

$$+\frac{1}{54}\,\frac{3.690112194\,m-2.716656840\,b+54.48942248}{1+(-1.358328420\,m+b-20.05752868)^2}$$
$$+\frac{1}{54}\,\frac{77.64958472\,m+12.46190874\,b-204.7894918}{1+(6.23095437\,m+b-16.43323636)^2}$$
$$+\frac{1}{54}\,\frac{62.97741626\,m+11.22296006\,b-199.8923313}{1+(5.61148003\,m+b-17.81101690)^2}$$
$$+\frac{1}{54}\,\frac{13.78798017\,m-5.251281780\,b+109.6821658}{1+(-2.625640890\,m+b-20.88674163)^2}$$
$$+\frac{1}{54}\,\frac{149.6881711\,m+17.30249526\,b-260.5411708}{1+(8.65124763\,m+b-15.05801139)^2}$$
$$+\frac{1}{54}\,\frac{0.02986065534\,m+0.24437944\,b-4.574512422}{1+(0.12218972\,m+b-18.71889232)^2}$$
$$+\frac{1}{54}\,\frac{0.01113480839\,m+0.14923008\,b-2.847427740}{1+(0.07461504\,m+b-19.08078948)^2}=0\Bigg\}$$

```
> solve(eq2, {m, b});
```

Warning, computation interrupted

We still sad. Whazza matta? We askin wrong question.

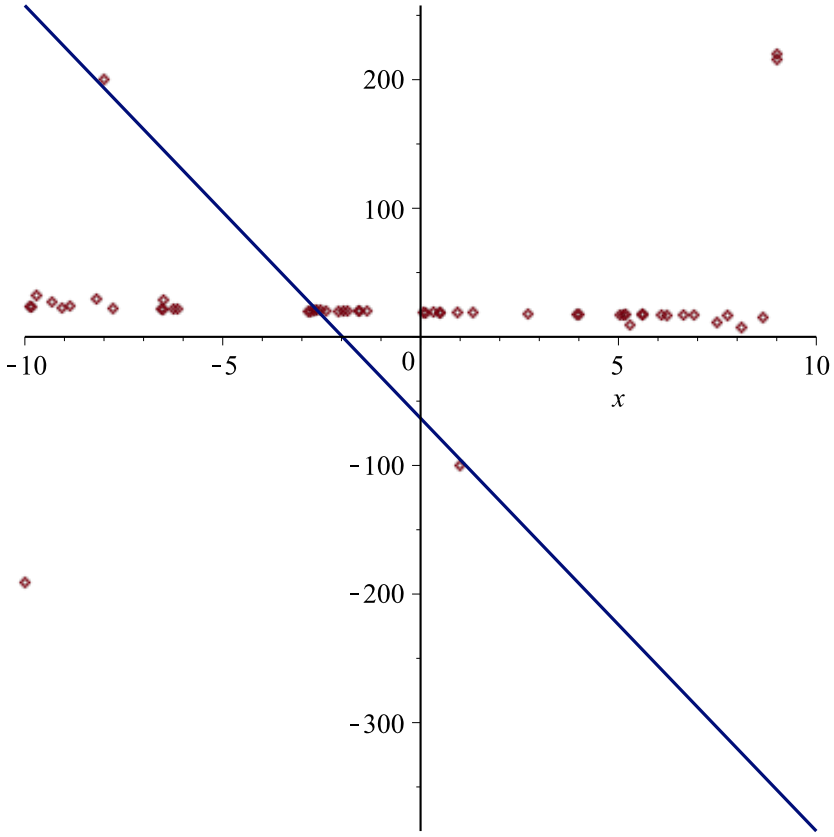
```
> fsolve(eq2, {m, b});
```

$$\{b=-63.30781812,\ m=-32.10088994\} \quad \textbf{(13)}$$

```
> edlin := subs(%, m·x + b);
```

$$edlin := -32.10088994\,x-63.30781812 \quad \textbf{(14)}$$

```
> plot([bdata, edlin], x=-10..10, style=[point, line]);
```



> $fsolve(eq2, \{m, b\}, \{m = -40..0, b = -65..0\});$

$$\{b = -29.20045015, m = -28.24296950\} \quad \textbf{(15)}$$

> eq := {diff(sumed(bdata, m, b), b) = 0, diff(sumed(bdata, m, b), m) = 0}:

> $fsolve(eq, \{m, b\}, \{m = -20..0, b = 0..25\});$

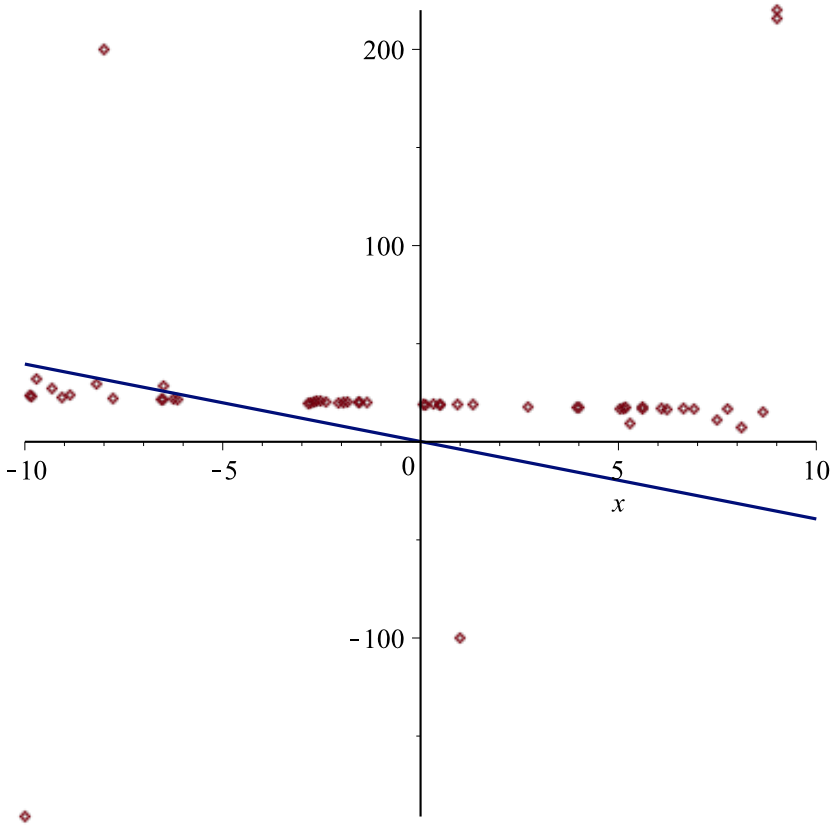
$$\{b = 0.1468343337, m = -3.947890977\} \quad \textbf{(16)}$$

Looks like lotsa critical points.

> $ed1lin := subs(\%, m \cdot x + b);$

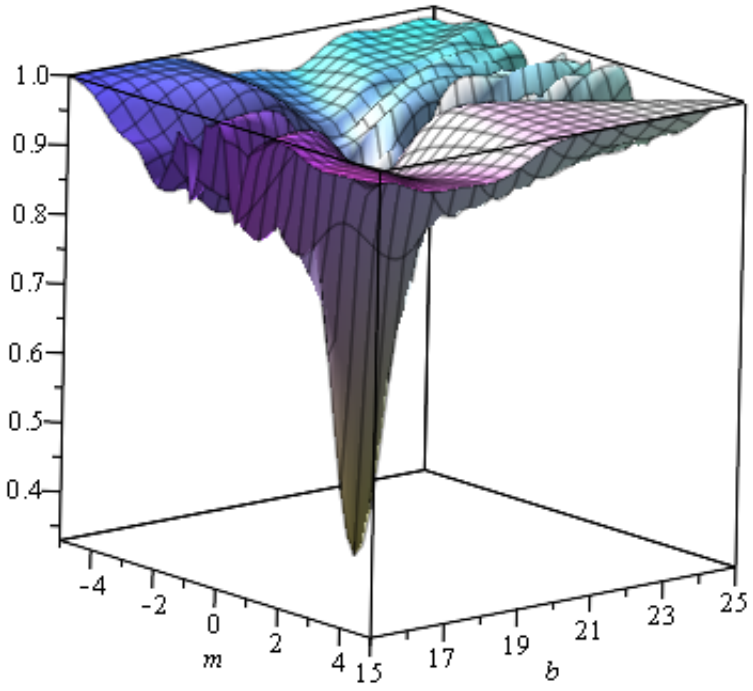
$$ed1lin := -3.947890977\, x + 0.1468343337 \quad \textbf{(17)}$$

> $plot([bdata, ed1lin], x = -10..10, style = [point, line])$



maybe look at a picture, get a better idea what's going on.

```
> plot3d(sumed(bdata, m, b), m=-5..5, b=15..25, axes=boxed)
```



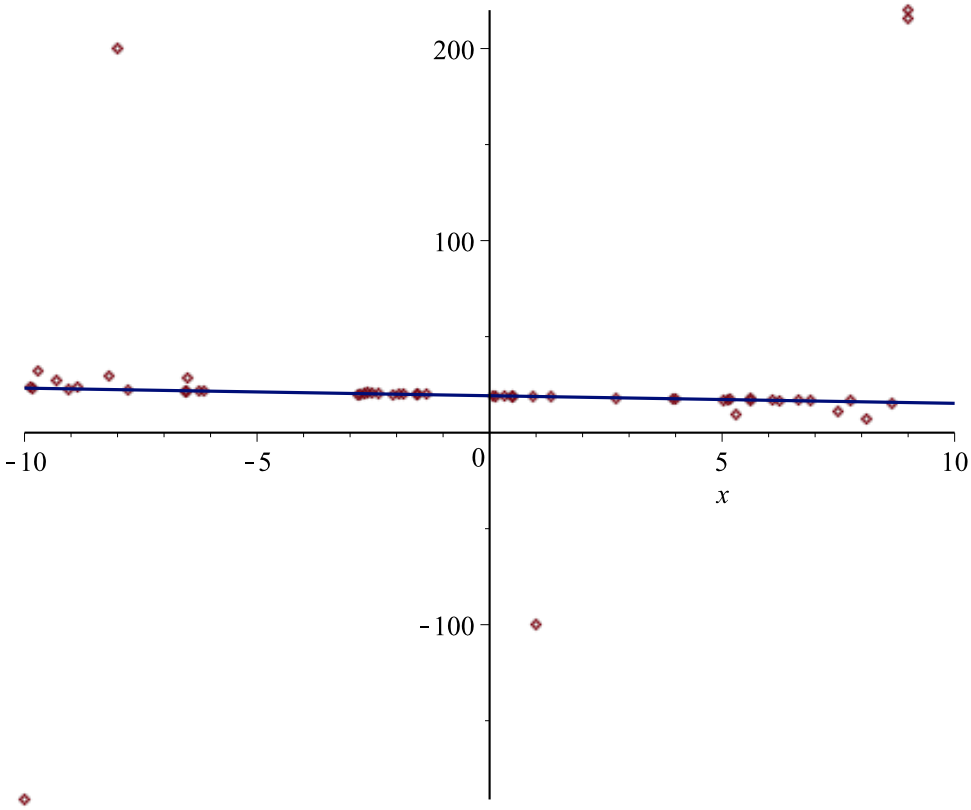

```
> fsolve(eq, {m, b}, {m = -1..1, b = 19..20})
```

$$\{b = 19.22337238,\ m = -0.3956278665\} \quad \textbf{(18)}$$

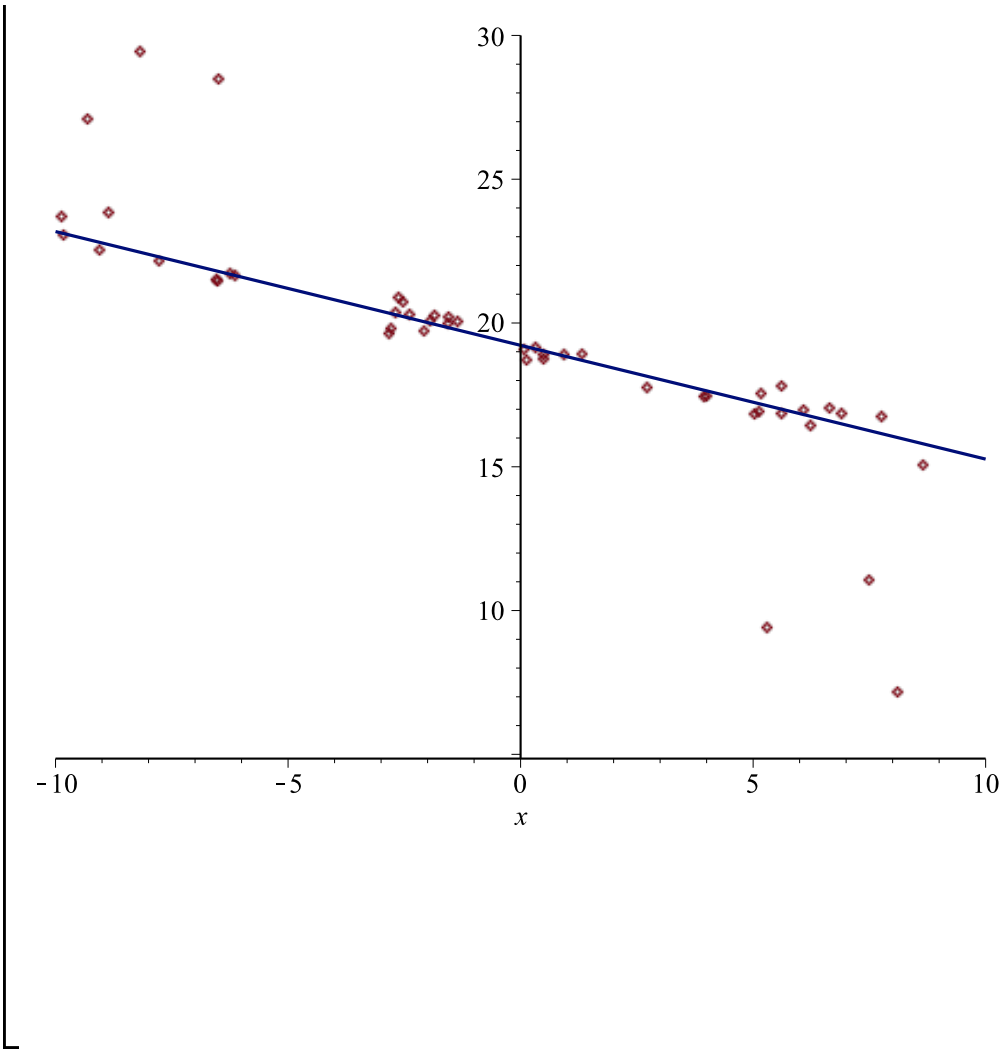
```
> ed1lin := subs(%, m·x + b);
```

$$ed1lin := -0.3956278665\,x + 19.22337238 \quad \textbf{(19)}$$

```
> plot([bdata, ed1lin], x = -10..10, style = [point, line])
```




```
> plot([bdata, ed1lin], x=-10..10, style=[point, line], view=[-10..10, 5..30])
```



Now THAT's what I'm talkin about!

>

>