```
--> kill ( all ) $ load ( distrib ) $ ratprint : false $ solveexplicit : true $ fpprintprec : 5 $
    load ( "fit.mac" ) $ display2d : true $
```

```
--> speed : [ 40 , 70 , 150 , 230 , 310 , 370 , 420 , 460 , 490 , 530 ] $ length ( speed ) ;
```

(%o8) 10

```
--> /* 1:u5 2:P34 3:dkw 4:etas 5:bsr 6:cp 7:cv 8:gamma 9:D5 10:VS */
    data : read_matrix ( "map.csv" ) $ /* must have commas!!! */
    trpdata1 : transpose ( data ) [ 1 ] $
    trpdata5 : transpose ( data ) [ 5 ] $
    trpdata4 : transpose ( data ) [ 4 ] $
    trpdata1 [ 50 ] ; length ( trpdata1 ) ;
```

(%o13) 70.0

(%o14) 185

```
--> speedsort : makelist ( [ ] , j , 1 , length ( speed ) , 1 ) $
    for j : 1 thru length ( speed ) do
      for i : 1 thru length ( trpdata1 ) do
        if round ( trpdata1 [ i ] ) = speed [ j ] then
            speedsort [ j ] : endcons ( [ trpdata5 [ i ] , trpdata4 [ i ] ] , speedsort [ j ] ) ;
    speedsort [ 1 ] $
```

(%o16) *done*

```
--> dataplot : makelist ( [ ] , i , 1 , length ( speed ) , 1 ) $
    for j : 1 thru length ( speed ) do (
      data5 [ j ] : makelist ( speedsort [ j ] [ i ] [ 1 ] , i , 1 , length ( speedsort [ j ] ) , 1 ) ,
      data4 [ j ] : makelist ( speedsort [ j ] [ i ] [ 2 ] , i , 1 , length ( speedsort [ j ] ) , 1 ) ,
      dataL [ j ] : makelist ( [ data5 [ j ] [ i ] , data4 [ j ] [ i ] ] , i , 1 , length ( data5 [ j ] ) , 1 ) ,
      dataplot [ j ] : endcons ( [ discrete , data5 [ j ] , data4 [ j ] ] , dataplot [ j ] )
    ) ;
```

(%o19) *done*

```
--> /* fit individual: sinus / just to one curve for illustration */ ;
```

```
--> sln : 2 ;
```

(%o20) 2

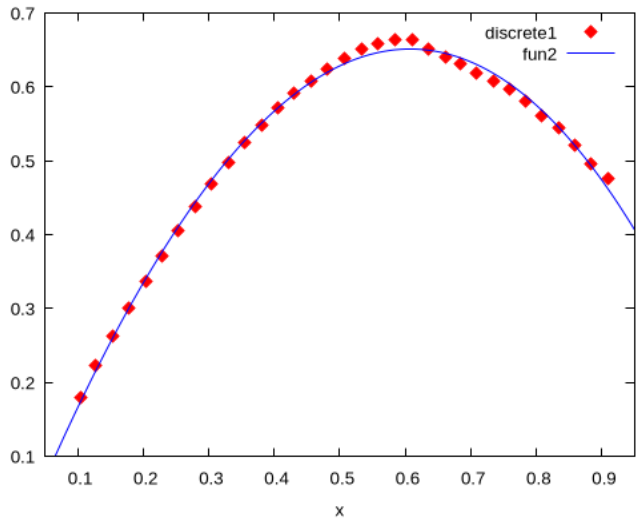
```
--> fn : a · x ^ 3 + b · x ^ 2 + c · x + d ;
```

(%o21) $a\,x^3 + b\,x^2 + cx + d$

```
--> dataM : apply ( ' matrix , dataL [ sln ] ) $
    lsq : lsquares_estimates (
          dataM , [ x , y ] , y = fn , [ a , b , c , d ] , initial = [ 1 . 0 , 1 . 0 , 1 . 0 , 1 . 0 ] , iprint = [ − 1 , 0 ] ) $
    fitleast : fn , lsq [ 1 ] $
    wxplot2d ( [ dataplot [ sln ] [ 1 ] , fitleast ] , [ x , 0 . 05 , 0 . 95 ] , [ y , 0 . 1 , 0 . 7 ] , [ style , points , lines ] , [ point_type , diamond ] , [ color , red , blue ] ) $
```

plot2d: some values were clipped.

(%t25)




```
--> floatfitleast : float ( fitleast ) ;
```

(%o26) $-0.232445x^3 - 1.57932x^2 + 2.17592x - 0.0356535$

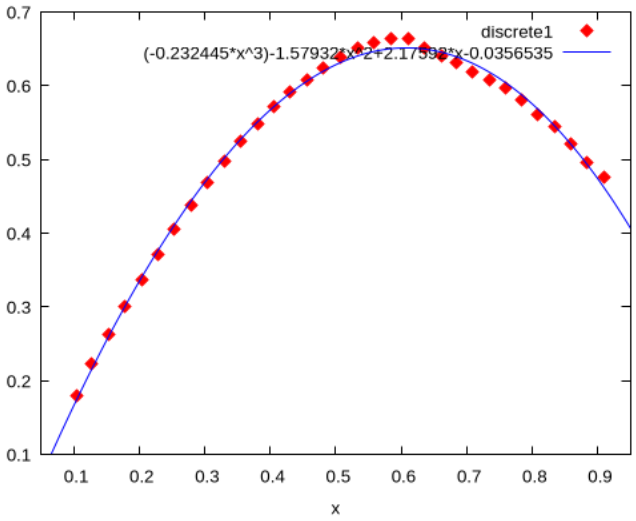
```
--> facA : coeff ( floatfitleast , x , 3 ) $
    facB : coeff ( floatfitleast , x , 2 ) $
    facC : coeff ( floatfitleast , x , 1 ) $
    facD : coeff ( floatfitleast , x , 0 ) $
```

```
--> /* nlf: nlfit (dataM,sigL,fn,[a,b,c,d],[facA,facB,facC,facD])$ */
```

```
--  dataM : apply ( ' matrix , dataL [ sln ] ) $
>   sigL : makelist ( 1 , i , 1 , length ( dataL [ sln ] ) ) $
    display ( sigL ) $
    nlf : nlfit ( dataM , sigL , fn , [ a , b , c , d ] , [ facA , facB , facC , facD ] ) $
    fitreference : ev ( fn , nlf [ 1 ] ) $
    wxplot2d ( [ dataplot [ sln ] [ 1 ] , fitreference ] , [ x , 0 . 05 , 0 . 95 ] , [ y , 0 . 1 , 0 . 7 ] , [ style , points , lines ] , [ point_type , diamond ] , [ color , red , blue ]
    ) $
```

$sigL = [1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1]$
$Ndata = 33$
$Nparam = 4$
$dof = 29$
$ivar = x$
$start : params : [a = -0.232445 , b = -1.57932 , c = 2.17592 , d = -0.0356535]\ chi2 = 0.00159431$
$---$
$nlam 10.001$
$p\_oldL = [-0.232445 , -1.57932 , 2.17592 , -0.0356535]$
$p\_newL = [-0.232445 , -1.57932 , 2.17592 , -0.0356535]\ chi2\_new = 0.00159431$
$---$
$chi2/dof = 5.4976310^{-5}$
$chi2\_prob = 100.0\%$
$---$
$a = -0.232445 +/- 6.7811$
$b = -1.57932 +/- 9.78899$
$c = 2.17592 +/- 4.71691$
$d = -0.0356535 +/- 0.790967$
plot2d: some values were clipped.

(%t36)




```
--  dataM : apply ( ' matrix , dataL [ sln ] ) $
>   sigL : [ 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 0 . 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 , 1 ] $
    display ( sigL ) $
    nlf : nlfit ( dataM , sigL , fn , [ a , b , c , d ] , [ facA , facB , facC , facD ] ) $
    fitweights : ev ( fn , nlf [ 1 ] ) $
    wxplot2d ( [ dataplot [ sln ] [ 1 ] , fitreference ] , [ x , 0 . 05 , 0 . 95 ] , [ y , 0 . 1 , 0 . 7 ] , [ style , points , lines ] , [ point_type , diamond ] , [ color , red , blue ]
    ) $
```

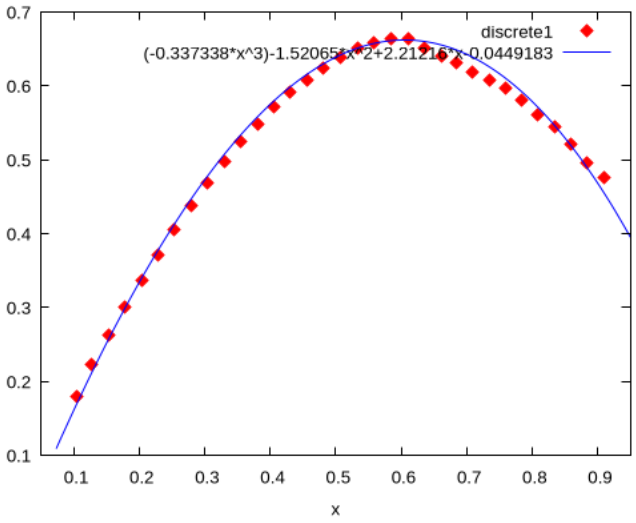
$sigL = [1,1,1,1,1,1,1,1,1,1,1,1,1,1,0.1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1]$
$Ndata = 33$
$Nparam = 4$
$dof = 29$
$ivar = x$
$start : params : [a = -0.232445, b = -1.57932, c = 2.17592, d = -0.0356535]$ $chi2 = 0.0172257$

$nlam 10.001$
$p\_oldL = [-0.232445, -1.57932, 2.17592, -0.0356535]$
$p\_newL = [-0.324303, -1.53326, 2.21282, -0.0437445]$ $chi2\_new = 0.0035399521.10^{-4}$
$p\_oldL = [-0.324303, -1.53326, 2.21282, -0.0437445]$
$p\_newL = [-0.337338, -1.52065, 2.21216, -0.0449183]$ $chi2\_new = 0.00351955$

$chi2/dof = 1.2136410^{-4}$
$chi2\_prob = 100.0\%$

$a = -0.337338 +/- 4.11529$
$b = -1.52065 +/- 5.74961$
$c = 2.21216 +/- 2.79626$
$d = -0.0449183 +/- 0.586761$
plot2d: some values were clipped.

(%t49)




```
-- wxplot2d ( [ dataplot [ sln ] [ 1 ] , fitleast , fitreference , fitweights ] , [ x , 0 . 05 , 0 . 95 ] , [ y , 0 . 1 , 0 . 7 ] , [ style , points , lines , lines , lines ] , [ point_type ,
>  diamond ] , [ color , red , blue , green , black ] ) $
```

plot2d: some values were clipped.
plot2d: some values were clipped.
plot2d: some values were clipped.

(%t50)