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SECTION 2. Applied mathematics. Mathematical modeling.

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ABOUT ONE INTERPOLATION MODEL PREDICTED VALUES

Abstract: *The article provides one way analysis of projected data, based on the method of partitioning of the graph and interpolation of functions by splines.*

Key words: *spline, interpolation, projected data.*
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This problem arose as a result of analysis of graphs and of discovering inaccurate data published in [1] .

Analysis of the Observed data is known, but Estimated by the authors alleged their statement is obtained by interpolation of Observed data. But we discovered that it is not so. The calculation is true only for the first 4 points, and when you try to predict the future points of forecast Estimated wrong.

The process of analysis and design of interpolation functions is shown in Fig.1-4.

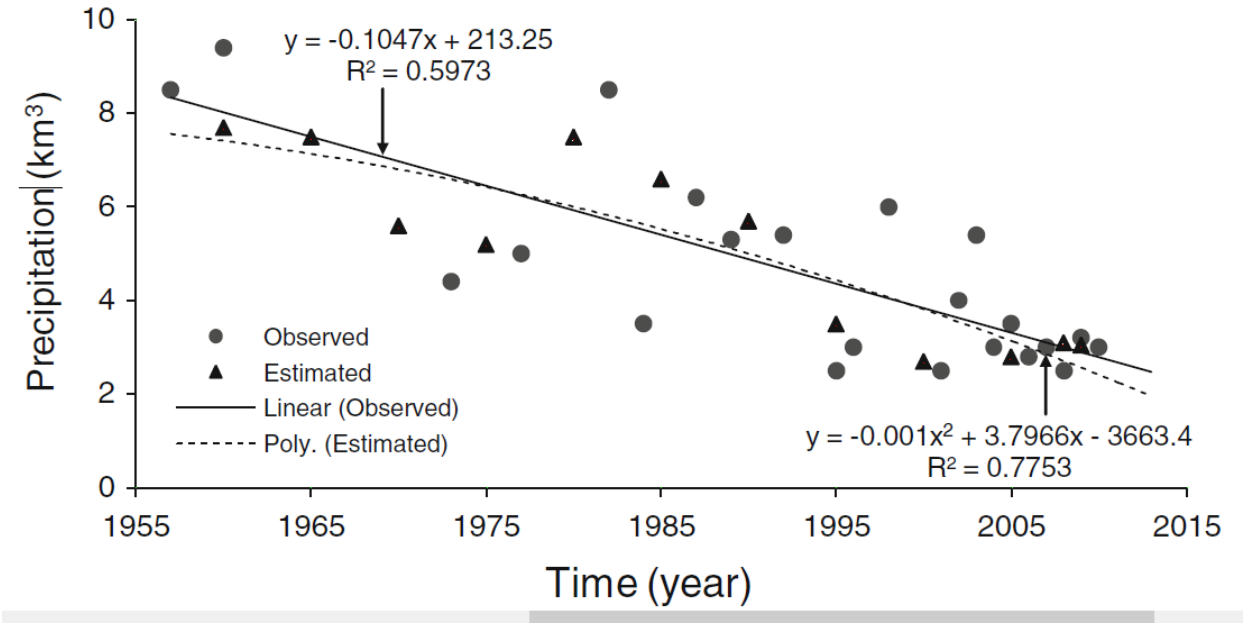


Figure 1 - Source data.

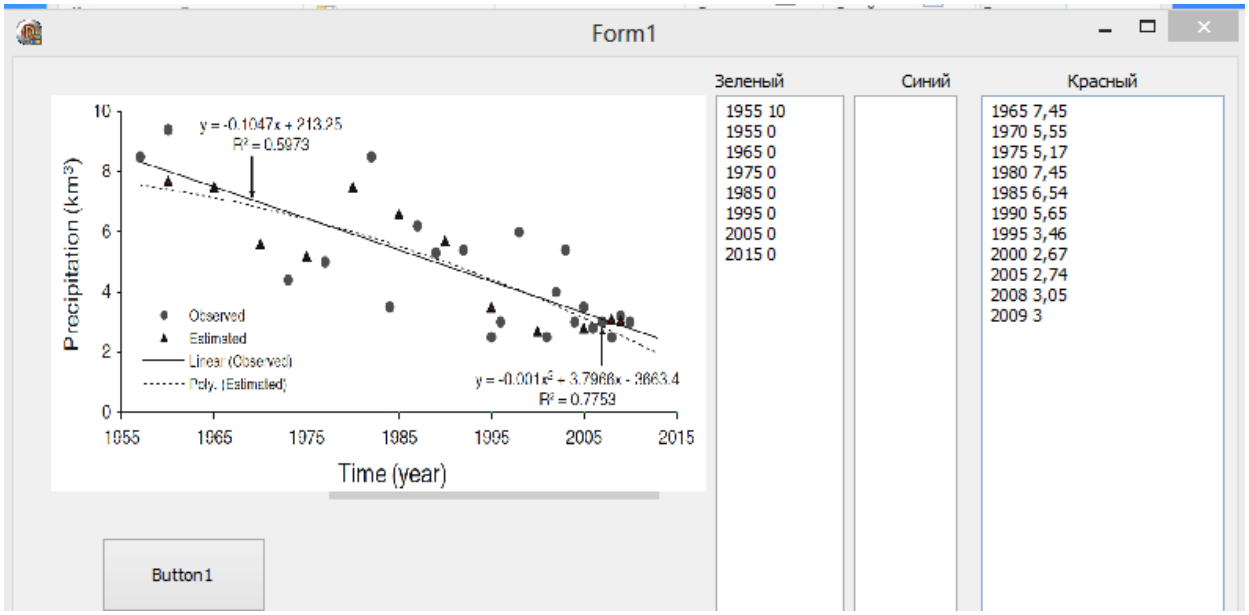


Figure 2 - Chart analysis and retrieval.

```
> restart; readlib(spline):X:='X':Y:='Y':
  X:=0,1,2,3,4,5,6,7,8,9,10,11:
  X1:=1960,1965,1970,1975,1980,1985,1990,1995,2000,2005,2008,2009:

  Y:=15.87,26.14,10.35,3.01,1.67,1.09,7.77,6.68,3.59,4.76,5.01,4.76:

  f:=[[X1[n+1],Y[n+1]] $n=0..11]:

> fc:=spline([X1],[Y],x,cubic);
  plot([f,fc],x=1955..2010,y=0..40,style=[point,line,line,line],color=[red,gr
  een,blue,red],thickness=2,symbol=circle);
```

Figure 3 - Analysis of data on Maple and the construction of spline functions..

$$fc := \begin{cases} 7.45 - 2.052594234\,x + .1525942425\,x^3 & x < 1 \\ 6.845565451 - .239290574\,x - 1.81330366\,x^2 + .757028796\,x^3 & x < 2 \\ 29.22747107 - 33.81214898\,x + 14.97312554\,x^2 - 2.040709405\,x^3 & x < 3 \\ -67.87852262 + 63.29384471\,x - 17.39553904\,x^2 + 1.555808881\,x^3 & x < 4 \\ 93.93493230 - 58.06624649\,x + 12.94448377\,x^2 - .972526352\,x^3 & x < 5 \\ -154.4179515 + 90.94548392\,x - 16.85786232\,x^2 + 1.014296721\,x^3 & x < 6 \\ 147.7568292 - 60.14190647\,x + 8.323369414\,x^2 - .3846605983\,x^3 & x < 7 \\ 21.18764135 - 5.897968794\,x + .5742354584\,x^2 - .01565421941\,x^3 & x < 8 \\ 101.6066454 - 36.05509532\,x + 4.343876274\,x^2 - .1727225868\,x^3 & x < 9 \\ -101.9790772 + 31.80681221\,x - 3.196335674\,x^2 + .1065445225\,x^3 & otherwise \end{cases}$$

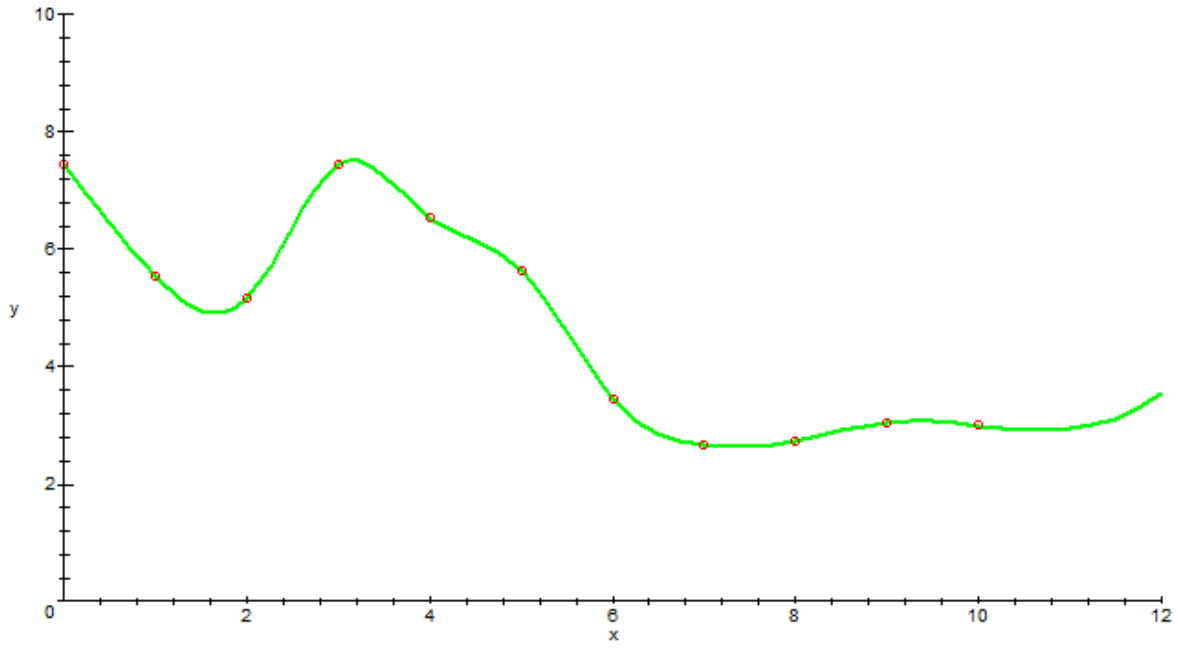


Figure 4 - The Spline function "Estimated".

```
lagr:=proc(Data::list(list))
local L,s,s1,Lg,x;
L:=0;
for s1 in Data do
Lg:=1;
for s in Data do
if s1[1]<>s[1] then
Lg:=Lg*(x-s[1])/(s1[1]-s[1]);
fi;
od;
L:=L+s1[2]*Lg;
od;
L:=collect(L,x);
unapply(L,x);
end:
```

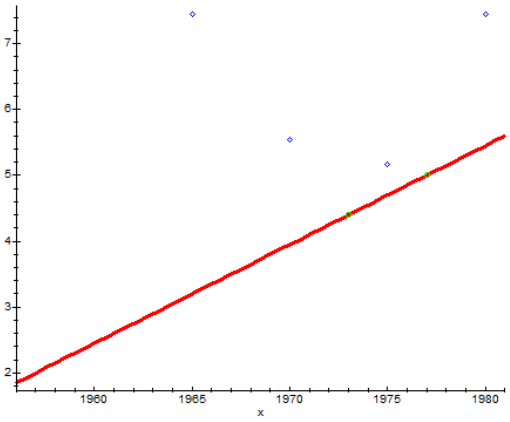
```
A:=[[1957,8.5],[1960,9.4],[1973,4.4],[1977,5]]:
E:=[[1965,7.45],[1970,5.55],[1975,5.17],[1980,7.45],[1985,6.54]]:

L:=lagr(A)(x);
Estimated_[1980]:=E[4][2];
Lagrange_[1980]:=subs(x=1980,L);
plot([L,A,E],x=1956..1981,style=[line,point,point,point],color=[r
ed,green,blue,red],thickness=3,symbol=[circle,circle,diamond]);
```

$L := .150000000\,x - 291.550000$

$Estimated_{-1980} := 7.45$

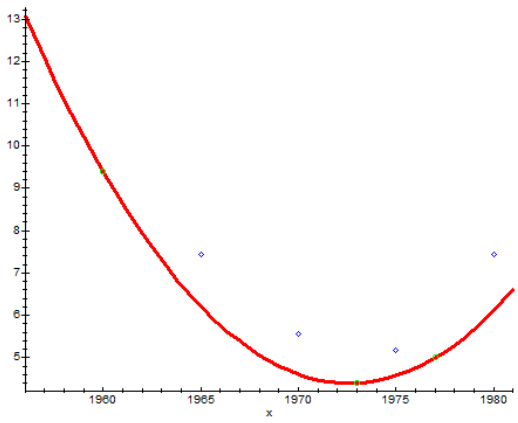
$Lagrange_{-1980} := 5.4500000$



$L := .03144796380\,x^2 - 124.0694571\,x + 122375.0380$

$Estimated_{-1980} := 7.45$

$Lagrange_{-1980} := 6.1102$



$$L := .003711821264\,x^3 - 21.90541571\,x^2 + 43091.25871\,x - .2825530461\,10^8$$

$$Estimated_{-1980} := 7.45$$

$$Lagrange_{-1980} := 7.58$$

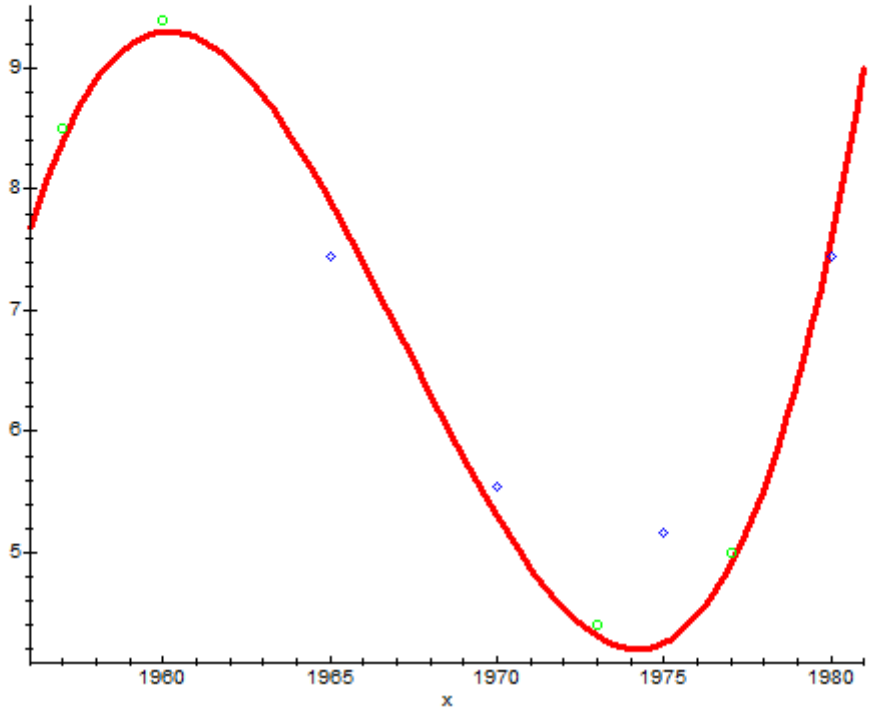
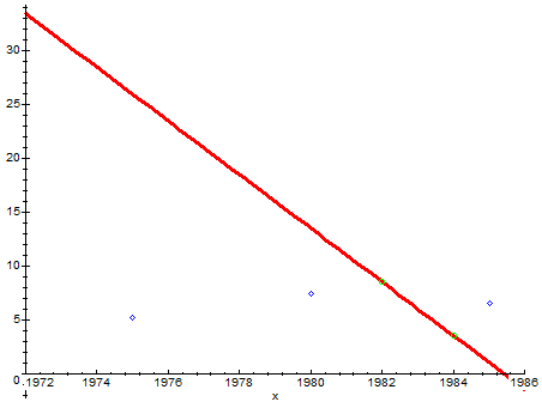


Figure 5 - Correct predictions "Estimated" on the first 4 points.

$L := -2.500000000\,x + 4963.5$

$Estimated_{-1985} := 6.54$

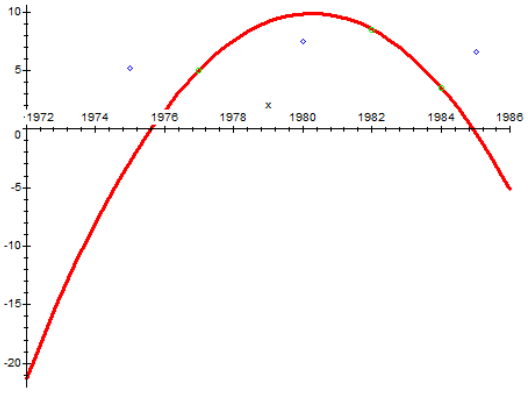
$Lagrange_{-1985} := 1.000000$



$L := -.4571428570\,x^2 + 1810.528571\,x - .1792653871\,10^7$

$Estimated_{-1985} := 6.54$

$Lagrange_{-1985} := -.372$



$L := -.04711399711\,x^3 + 279.5413419\,x^2 - 552865.8578\,x + .3644778435\,10^9$

$Estimated_{-1985} := 6.54$

$Lagrange_{-1985} := -2.8$

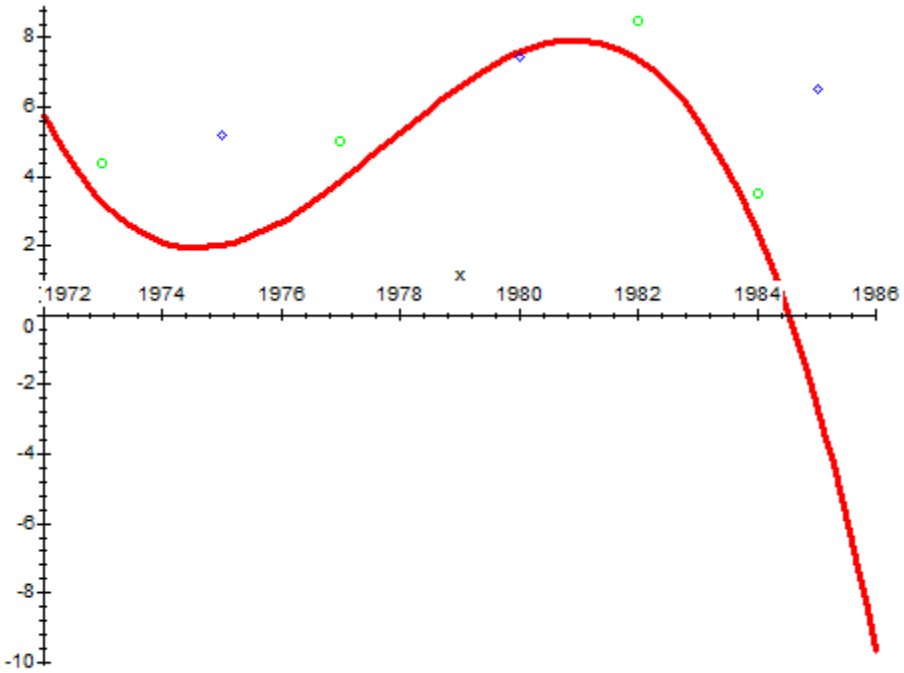


Figure 6 - Incorrect prediction "Estimated".

$$L := -.1357142858\,x^3 + 808.5871442\,x^2 - .1605855596\,10^7\,x + .1063076554\,10^{10}$$

$$Estimated_{-1990} := 5.65$$

$$Lagrange_{-1990} := 3.$$

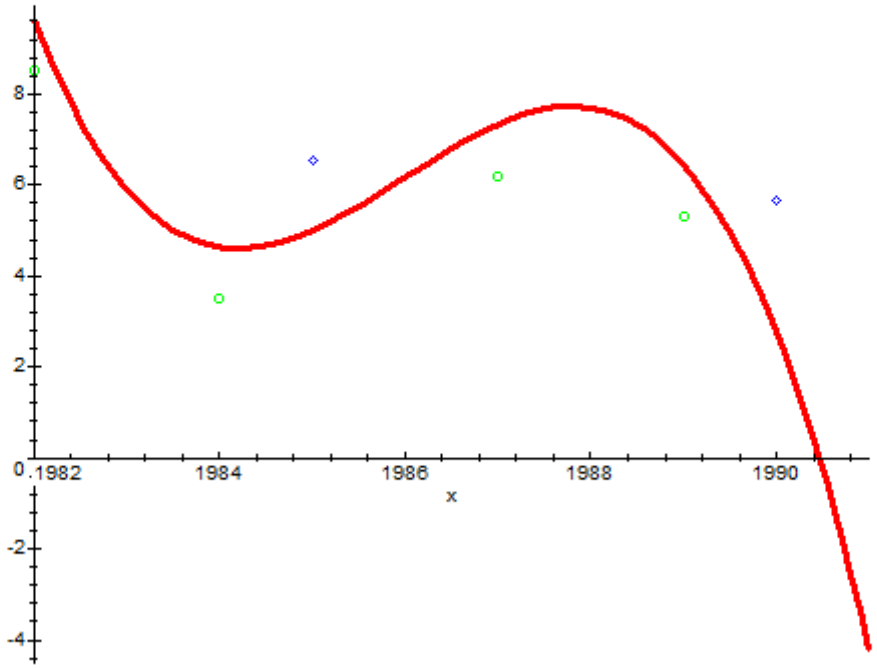


Figure 7 - Incorrect prediction "Estimated".

In conclusion we can say that the predictions were incorrect. Although the fourth point forecast and the same (Fig.5), but all the other points of interpolation of Lagrange 4 of the order are not applicable to predict (Fig.6-7) .

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