Interpolation method

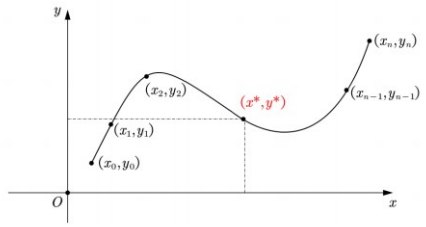
HHH Little

2021.7.20

1 Conception of Interpolation method

We need to construct a function which can make sure that every points satisfy the function.

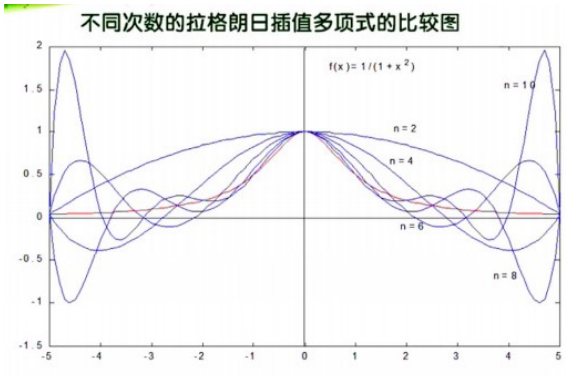
问题如下：已经有$n+1$个节点$(x_i,y_i)(i=0,1,\cdots,n)$，其中$x_i$互不相同
不妨假设$a=x_0<x_1<\cdots<x_n=b$，求任一插值点$x^*(\neq x_i)$处的插值y^*



思路：构造函数$y=f(x)$，使得$f(x)$过所有节点，求$f(x^*)$即可得到y^*

2 Runge phenomenon

The high order interpolation will construct the **Runge phenomenon**.Namely at both ends fluctuate greatly, produce obvious concussion. Don't use the high order interpolation lightly when we don't know the line's frequence of sport.



3 Piecewise Interpolation

In order to avoid the Runge phenomenon, the Piecewise Interpolation has the low order. So the possibility will be reduced.

4 Hermite Interpolation

The Hermite asks that the value of function are the same and the corresponding derivatives are the same so far as to the higher derivatives. So the function constructed by Hermite Interpolation are more smooth and constant.

Matters need attention
Only to use the Hermite Interpolation still has the possibility of constructint the Runge phenomenon. In the real life, we usually use the Segment three Hermite interpolation(PCHIP).

5 Cublic Spline Interpolation

Cublic Spline Interpolation has strong mathmatical properties.