Inverse Interpolation

For a set of values of x and y, we were finding the values of y corresponding to some $x = x_k$. Here we treat y as a function of x.

Now the problem is, given some $y = y_r$, we should find the corresponding x. This process of finding x given y is called the inverse interpolation.

In such a case, we will take y as independent variable and x as dependent variable and use Lagrange's interpolation formula.

Taking y as independent variable,

$$x = \frac{(y-y_1)(y-y_2)\cdots(y-y_n)}{(y_0-y_1)(y_0-y_2)\cdots(y_0-y_n)} \cdot x_0$$

$$+ \frac{(y-y_0)(y-y_2)\cdots(y-y_n)}{(y_1-y_0)(y_1-y_2)\cdots(y_1-y_n} \cdot x_1$$

$$+ \cdots$$

$$+ \frac{(y-y_0)(y-y_1)\cdots(y-y_{n-1})}{(y_n-y_0)(y_n-y_1)\cdots(y_n-y_{n-1})} \cdot x_n \quad \rightarrow (1)$$

This formula (1) is called formula of inverse interpolation.

① Problem.

From the data given below, find the value of x when $y = 13.5$

Ans: $x = 99.6539503$

x :	93.0	96.2	100.0	104.2	108.7
y :	11.38	12.80	14.70	17.07	19.91

② Find the age corresponding to the annuity value 13.6 given the table

Ans: $x = 43$

Age (x):	30	35	40	45	50
Annuity value (y):	15.9	14.9	14.1	13.3	12.5