Least Fitting Method(Exponential)

Aim

Write code using linearization of nonlinear equation 1.

x	2	4	6	8	10
y	4.071	11.084	30.084	81.897	222.624

Algorithm

1. Give the header file.
2. Then make the user to input the no. of data pair of x and y, using array function and for loop.
3. Then generate a table for all the data that is x, y, xy, x^2.
4. Then using the for loop we will calculate the sum and the by using the formula of a and b.
5. Give the values of a and b.
6. Then write the final equation that we get of straight

Code

```
#include<bits\stdc++.h>
using namespace std;
int main()
{
    int i,j,k,n;
    cout<<"\nEnter the no. of data pairs to be entered:\n";        //To find
the size of arrays
    cin>>n;
    double x[n],y[n],lny[n],a,b,c;
    cout<<"\nEnter the x-axis values:\n";                //Input x-
values(observed)
    for (i=0;i<n;i++)
        cin>>x[i];
    cout<<"\nEnter the y-axis values:\n";                //Input y-
values(observed)
    for (i=0;i<n;i++)
        cin>>y[i];
    for (i=0;i<n;i++)                        //Calculate the values of ln(yi)
        lny[i]=log(y[i]);
```

```
    double xsum=0,x2sum=0,ysum=0,xysum=0;                //variables for
sums/sigma of xi,yi,xi^2,xiyi etc
    for (i=0;i<n;i++)
    {
        xsum=xsum+x[i];                        //calculate sigma(xi)
        ysum=ysum+lny[i];                        //calculate sigma(yi)
        x2sum=x2sum+pow(x[i],2);                //calculate sigma(x^2i)
        xysum=xysum+x[i]*lny[i];                    //calculate sigma(xi*yi)
    }
    a=(n*xysum-xsum*ysum)/(n*x2sum-xsum*xsum);            //calculate slope(or
the the power of exp)
    b=(x2sum*ysum-xsum*xysum)/(x2sum*n-xsum*xsum);            //calculate
intercept
    c=pow(2.71828,b);                        //since b=ln(c)
    double y_fit[n];                        //an array to store the new fitted
values of y
    for (i=0;i<n;i++)
        y_fit[i]=c*pow(2.71828,a*x[i]);                    //to calculate
y(fitted) at given x points
    cout<<"S.no"<<setw(5)<<"x"<<setw(19)<<"y(observed)"<<setw(19)<<"y(fitted)"
<<endl;
    cout<<"-------------------------------------------------------------------
\n";
    for (i=0;i<n;i++)
        cout<<i+1<<"."<<setw(8)<<x[i]<<setw(15)<<y[i]<<setw(18)<<y_fit[i]<<end
l;//print a table of x,y(obs.) and y(fit.)
    cout<<"\nThe corresponding line is of the form:\n\nlny = "<<a<<"x +
ln"<<b<<endl;
    cout<<"\nThe exponential fit is given by:\ny = "<<c<<"e^"<<a<<"x\n";
    return 0;
}
```

Output

For 1st Data :

```
Enter the no. of data pairs to be entered:
5

Enter the x-axis values:
2 4 6 8 10

Enter the y-axis values:
4.071 11.084 30.084 81.897 222.62
S.no    x        y(observed)          y(fitted)
-----------------------------------------------------------------
1.       2          4.071           4.07243
2.       4         11.084           11.0734
3.       6         30.084           30.1101
4.       8         81.897           81.8732
5.      10         222.62           222.624

The corresponding line is of the form:

lny = 0.500156x + ln0.403928

The exponential fit is given by:
y = 1.4977e^0.500156x
PS C:\Users\thegr\Desktop\DU\Sem 4\Sec Lab>
```

Graph