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#include <math.h>
#include <stdio.h>

double x[100];
double f[100];

double func(double x)
{
    return sin(x);
}

long double fact(int k)
{
    if(k==0 || k==1)
    {
        return 1;
    }

    return k*fact(k-1);
}

long double Cnk(int n, int k)
{
    return fact(n) / (fact(k) * fact((n - k)));
}

int step (int n)
{
    if (n%2)
    {
        return -1;
    }
    else
    {
        return 1;
    }
}

long double deltaf(int n)
{
    long double r=0;
    int k;
    for(k=0; k <=n; k++)
    {
        r+= f[k]*step(n-k)*Cnk(n,k);
    }
    return r;
}

long double factmn(double t, int k)
{
    long double mn=1;
    int i;
    if(k==0)
    {
        mn=1;
    }
    else
    {
        for (i=0; i <k; i++)
        {
            mn *= (t-i);
        }
    }
}

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        return mn;
    }

double fappr(int n, double t)
{
    int k;
    double res = 0;
    for(k = 0; k <=n; k++)
    {
        res += deltaf(k) * factmn(t, k) / fact(k);
    }

    return res;
}

double Eps(double appr, double in)
{
    return fabs(appr - in) ;
}

int main(int argc, char **argv){
    int n = 20;
    int i;
    double a =0;
    double b = 1.0;
    double h = (b-a)/20;

    FILE *file1, *file2, *file3;
    file1 = fopen("in.txt","r");

    for (i=0; i <=n; i++)
    {
        fscanf(file1, "%le \t %le", &x[i] , &f[i]);
    }
    fclose(file1);

    file2 = fopen("fappr.txt","w");
    file3 = fopen("R.txt","w");

    double t=0;
    double ht = (n-0.0)/(20.0*n);
    int j = 0;
    for (j = 0; j <= 20*n; j++)
    {
        fprintf(file2, "%e \t %e\n", t, fappr(n, t));
        fprintf(file3, "%e \t %e\n", t, Eps(func(a + h*t), fappr(n, t)));
        t=t+ht;
    }
    fclose(file2);
    fclose(file3);

    return 0;
}

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