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#include "
href../../common/math/integral_h_src.pdfintegral.h"
#include "
href../../common/math/moments_h_src.pdfmoments.h"
#include <stddef.h>
#include <stdlib.h>

#define FUNC(x) ((*func)(x))
#define FUNK(x) (2.0*(x)*(*func2)(aa+(x)*(x)))
#define FUNKY(x) ((*func1)(1.0/(x))/((x)*(x)))
/* pour le changement de variable qui ramene [a,b] a [0,1]*/
#define FUNCG(x) ((*funcg)(a + (b-a)*(x)))

#define FUNCG_VECT(x,n,fx) ((*funcg_vect)((a + (b-a)*(x))), n , fx) )
#define NR_END 1
#define FREE_ARG char*

static int ngauss = -1;
static double *xi, *wi;

/* static double midpnt(double (*func)(double), double a, double b, int n)
 * {
 *   double x,tnm,sum,del,ddel;
 *   double s;
 *   int it,j;
 *
 *   if(n==1){
 *     s=(b-a)*FUNC(0.5*(a+b));
 *     return s;
 *   } else {
 *     for(it=1,j=1;j<n-1;j++) it*=3;
 *     tnm=it;
 *     del=(b-a)/(3.0*tnm);
 *     ddel=del+del;
 *     x=a+0.5*del;
 *     sum=0.0;
 *     for(j=1;j<=it;j++) {
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*         sum+=FUNC(x);
*         x+=ddel;
*         sum+=FUNC(x);
*         x+=del;
*
*     }
*     s=( midpnt(func,a,b,n-1) + (b-a)*sum/tnm )/3.0;
*     return s;
* }
* }
*
* static double midpntbis(double (*func)(double), double a, double b, int n){
*     double x,tnm,sum,del,ddel;
*     static double s;
*     int it,j;
*
*     if(n==1){
*         s=(b-a)*FUNC(0.5*(a+b));
*         return s;
*     }
*     else {
*         for(it=1,j=1;j<n-1;j++) it*=3;
*         tnm=it;
*         del=(b-a)/(3.0*tnm);
*         ddel=del+del;
*         x=a+0.5*del;
*         sum=0.0;
*         for(j=1;j<=it;j++){
*             sum+=FUNC(x);
*             x+=ddel;
*             sum+=FUNC(x);
*             x+=del;
*         }
*         s=( midpntbis(func,a,b,n-1) + (b-a)*sum/tnm )/3.0;
*         return s;
*     }
* }
*
* static double midsql(double (*func2)(double), double aa, double bb, int n){
*     double x,tnm,sum,del,ddel,b,a;
*     static double s;

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*   int it,j;
*
*   b=sqrt(bb-aa);
*   a=0.0;
*   if(n==1) {
*       s=(b-a)*FUNK(0.5*(a+b));
*       return s;
*   } else {
*       for(it=1,j=1;j<n-1;j++) it*=3;
*       tnm=it;
*       del=(b-a)/(3.0*tnm);
*       ddel=del+del;
*       x=a+0.5*del;
*       sum=0.0;
*       for(j=1;j<=it;j++){
*           sum+=FUNK(x);
*           x+=ddel;
*           sum+=FUNK(x);
*           x+=del;
*       }
*       s=( midsql(func2,aa,bb,n-1) + (b-a)*sum/tnm )/3.0;
*       return s;
*   }
* }
*
*
* static double midsqlbis(double (*func2)(double), double aa, double bb, int n)
* double x,tnm,sum,del,ddel,b,a;
* static double s;
* int it,j;
*
* b=sqrt(bb-aa);
* a=0.0;
* if(n==1) {
*     s=(b-a)*FUNK(0.5*(a+b));
*     return s;
* } else {
*     for(it=1,j=1;j<n-1;j++) it*=3;
*     tnm=it;
*     del=(b-a)/(3.0*tnm);
*     ddel=del+del;

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*     x=a+0.5*del;
*     sum=0.0;
*     for(j=1;j<=it;j++) {
*         sum+=FUNK(x);
*         x+=ddel;
*         sum+=FUNK(x);
*         x+=del;
*     }
*     s=( midsqldbis(func2,aa,bb,n-1) + (b-a)*sum/tnm )/3.0;
*     return s;
* }
* }
*
* static double midinf(double (*func1)(double), double aa, double bb, int n){
*     double x,tnm,sum,del,ddel,b,a;
*     static double s;
*     int it,j;
*
*     b=1.0/aa;
*     a=1.0/bb;
*     if(n==1){
*         s=(b-a)*FUNKY(0.5*(a+b));
*         return s;
*     } else {
*         for(it=1,j=1;j<n-1;j++) it*=3;
*         tnm=it;
*         del=(b-a)/(3.0*tnm);
*         ddel=del+del;
*         x=a+0.5*del;
*         sum=0.0;
*         for(j=1;j<=it;j++){
*             sum+=FUNKY(x);
*             x+=ddel;
*             sum+=FUNKY(x);
*             x+=del;
*         }
*         s=( midinf(func1,aa,bb,n-1) + (b-a)*sum/tnm )/3.0;
*         return s;
*     }
* } */

```

```

/*-----*/
double integrale_gauss(double (*funcg)(double), double a, double b)
{
    int i;
    double sum = 0.;

    if (ngauss < 0)
    {
        printf("Erreur : vous devez initialiser les points de les poids de Gauss.\n");
        exit(-1);
    }

    for (i = 1; i <= n_gauss; i++)
    {
        sum += wi[i] * FUNCg(xi[i]);
    }
    /*pour le changement de variable qui ramene [a,b] a [0,1]*/
    sum *= (b - a);
    return sum;
}

/*-----*/
void integrale_gauss_vect(void (*funcg_vect)(double, int, double *), double a, d
{
    int i, n;
    double *fx;
    double x;

    for (n = 0; n < dimx; n++) sum[n] = 0.;

    fx = malloc(sizeof(double) * dimx);

    if (ngauss < 0)
    {
        printf("Erreur : vous devez initialiser les points de les poids de Gauss.\n");
        exit(-1);
    }
    for (i = 1; i <= n_gauss; i++)
    {
        x = xi[i];

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        FUNCG_VECT(x, dimx, fx);
        for (n = 0; n < dimx; n++)
            sum[n] = sum[n] + wi[i] * fx[n];
    }
    /* pour le changement de variable qui ramene [a,b] a [0,1]*/
    for (n = 0; n < dimx; n++)
        sum[n] = sum[n] * (b - a);

    free(fx);

}
/*-----*/

void init_gauss(int nbpts)
{
    ngauss = nbpts;
    xi = malloc(sizeof(double) * (ngauss + 1));
    wi = malloc(sizeof(double) * (ngauss + 1));
    gauleg(0., 1., xi, wi, ngauss);
}
/*-----*/

void free_gauss()
{
    free(xi);
    free(wi);
}

```