

[Help](#)

```
#if defined(PremiaCurrentVersion) && PremiaCurrentVersion < (2007+2) //The "#els
#else

#ifdef MATHSB_H
#define MATHSB_H

#include <cmath>
#include <valarray>
#include <iostream>

extern "C" {
#include "pnl/pnl_mathtools.h"
}
////////////////////////////////////////////////////////////////
//
// represents a function from R to R by its values in the points
// xleft + j*xstep for j=0,...,xnumber-1;
// f(xleft + j*xstep) corresponds to f.val[j]
//
////////////////////////////////////////////////////////////////
struct discrete_fct
{
    double xleft;
    double xstep;
    int xnumber;
    double *val;
};

double Normal(double mean, double var, double f(double), double intervallength,
// computes E(f(X)), where X is normally distributed N(mean,var)

double NormalTab(double mean, double var, discrete_fct *f);
// computes E(f(X)), where X is normally distributed N(mean,var)

void Set_discrete_fct(discrete_fct *f, double xleft, double xstep, int xnumber);

void SetNf(discrete_fct *g, double var, discrete_fct *f);
// Sets g = NormalTab(0, var, f) in a reasonable way
```

```

//void SetU (discrete_fct *f, double t, double s, discrete_fct *g, double xstep)
// Sets f=U_{t,s}g in a reasonable way

double NfUpBound(discrete_fct *f, double var, double vmax);
// returns the minimum of all x>=f.xleft such that NormalTab(0,var,f*1_{(x,infty)}

double NfLoBound(discrete_fct *f, double var, double vmin);
// returns the minimum of all x<=f.xleft+(f.xnumber-2)*f.xstep
// such that NormalTab(0,var,f*1_{(x,infty)}) > vmin

double InterpolDiscreteFct(discrete_fct *f, double x);
// returns f(x) via LINEAR interpolation

void ShowDiscreteFct(discrete_fct *f);

void ShowDiscreteFctVal(discrete_fct *f);

void SaveDiscreteFctToFile(discrete_fct *f, char *name);

void SaveArrayToFile(double *tab, int n, char *name);

void Delete_discrete_fct(discrete_fct *f);

////////////////////////////////////
//                                     //
// Minimization/Maximization of functions //
//                                     //
////////////////////////////////////

class NumFct1D
{
public:
    NumFct1D() {}
    virtual ~NumFct1D() {}
    virtual double Eval(double) = 0;
};

```

```

void GoldenSectionMin1D(NumFct1D &f, double ax, double bx, double &xmin);
// given f,ax,bx, this routine computes at first new points ax,bx,cx which
// bracket a minimum of f: ax<bx<cx and f(b)<min(f(a),f(c))
// then it performs a Golden Section search for xmin

```

```

class SiN : public NumFct1D
{
public:
    SiN(): NumFct1D() {}
    double Eval(double x)
    {
        return fabs(x - 8.);
    }
};

```

```

////////////////////////////////////
//                               //
// Matrices and valarrays //
//                               //
////////////////////////////////////

```

```

double ScalarProd(std::valarray<double> &x, std::valarray<double> &y);
// returns (x*y).sum()

```

```

void VectorProd(std::valarray<double> &x, std::valarray<double> &mat);
// Supposes that d:=dim(x)>=sqrt(dim(mat));
// sets mat[i*d+j]:=x[i]*x[j] for i,j=0,...,d-1

```

```

std::valarray<double> MatrixVectorProd(std::valarray<double> &M,
                                       std::valarray<double> &x);
// sets d=x.size() and D=M.size()/d

```

```
// M is a matrix with D lines and d columns; M_{i,j} = M[i*d+j]
// x is a column vector with d entries
// the result M*x is a vector with D entries

#endif

#endif //PremiaCurrentVersion
```