- `n` : matrix $\mathbf{N}$ of integers ≥ 1.
- `p` : matrix $\mathbf{P}$ of integers of the same size as $\mathbf{N}$. Each element p_i of $\mathbf{P}$ must verify $0 \leq p_i \leq n_i$.
- `c` : matrix $\mathbf{C}$ of integers.

Description

Compute in matrix $\mathbf{C}$ the combinations C_n^p for each elements of matrices $\mathbf{N}$ and $\mathbf{P}$.

Examples

```
c=combination(10*ones(1,10+1)',(0:10)');
mprintf("C(10,%2d) = %d\n",[(0:10)',c])
```

6.5 `depth` - multivariate depth

Calling Sequence

```
[d,id]=depth(x,dep)
[d,id]=depth(x,dep,y)
```

Parameters

- `x` : real matrix $\mathbf{X}$ of size (n_X, p).
- `y` : real matrix $\mathbf{Y}$ of size (n_Y, p). Default is `x`.
- `dep` : multivariate definition of depth in $\mathbb{R}^p$. Must be `"halfspace"`, `"majority"` or `"simplicial"`.
- `d` : column vector $\mathbf{d}$ of depths.
- `id` : vector of indices corresponding to the depths sorted in descending order.

Description

Compute in vector $\mathbf{d}$ the depths for each row vector of matrix $\mathbf{Y}$ based on row vectors in matrix $\mathbf{X}$. The indices corresponding to the depths sorted in descending order are in `id`, i.e. `x(id1(1),:)` is a potential multivariate median. `[d,id]=depth(x,dep)` is equivalent to `[d,id]=depth(x,dep,x)`.

Examples

```
x=rdmultinormal(100,[0,0],[2,1.9;1.9,5]);
[d1,id1]=depth(x,"halfspace");
[d2,id2]=depth(x,"majority");
[d3,id3]=depth(x,"simplicial");
//
xset("window",0)
xbasc();plot2d(x(:,1),x(:,2),-6)
xset("color",4)
plot2d(x(id1(1:20),1),x(id1(1:20),2),-6)
```

```
xset("color",5)
plot2d(x(id1(81:100),1),x(id1(81:100),2),-6)
xset("color",0);xtitle("HALFSPACE MULTIVARIATE DEPTH");xselect()
//
xset("window",1)
xbasc();plot2d(x(:,1),x(:,2),-6)
xset("color",4)
plot2d(x(id2(1:20),1),x(id2(1:20),2),-6)
xset("color",5)
plot2d(x(id2(81:100),1),x(id2(81:100),2),-6)
xset("color",0);xtitle("MAJORITY MULTIVARIATE DEPTH");xselect()
//
xset("window",2)
xbasc();plot2d(x(:,1),x(:,2),-6)
xset("color",4)
plot2d(x(id3(1:20),1),x(id3(1:20),2),-6)
xset("color",5)
plot2d(x(id3(81:100),1),x(id3(81:100),2),-6)
xset("color",0);xtitle("SIMPLICIAL MULTIVARIATE DEPTH");xselect()
```

6.6 `hausdorff` - Hausdorff distance between polylines

Calling Sequence

```
h=hausdorff(x,y)
h=hausdorff(x,y,q)
```

Parameters

- `x` : real matrix $\mathbf{X}$ of size (n_X, p).
- `y` : real matrix $\mathbf{Y}$ of size (n_Y, p).
- `q` : quantile q used for the Hausdorff distance. Default is `0.5`, i.e. the sample median.
- `h` : Hausdorff distance between polylines $\mathbf{X}$ and $\mathbf{Y}$.

Description

Compute the Hausdorff distance between polylines $\mathbf{X}$ and $\mathbf{Y}$ using the Euclidean distance.

Examples

```
x=linspace(-%pi,%pi)';
y1=sin(x)+rdnormal(100,sigma=0.1);
y2=sin(x)+rdnormal(100,sigma=0.1);
y3=sin(2*x)+rdnormal(100,sigma=0.1);
hausdorff([x,y1],[x,y2])
hausdorff([x,y1],[x,y3])
```