

MULTIPLICATION DE POLYNÔMES

```
{polmul(U,V)=
local(W,e,d);
d=length(U)-1;
e=length(V)-1;
W=vector(d+e+1);
for(i=0,d,
for(j=0,e,
W[i+j+1]=W[i+j+1]+U[i+1]*V[j+1];
);
);
return(W);
}
```

```
{karamul(U,V)=
local(lU,lV,L,UU,VV);
lU=length(U);
lV=length(V);
L=1;until((L>=lU)*(L>=lV),L=L*2);
UU=concat(U,vector(L-lU));
VV=concat(V,vector(L-lV));
return(Karamul(UU,VV));
}
```

```
{Karamul(U,V)=
local(L,U0,U1,V0,V1,M,W0,W1,W2);
L=length(U);
if(L==1,return([U[1]*V[1],0]),
M=L/2;
U0=vector(M);
V0=vector(M);
U1=vector(M);
V1=vector(M);
for(k=1,M,U0[k]=U[k];U1[k]=U[k+M];V0[k]=V[k];V1[k]=V[k+M]);
W0=Karamul(U0,V0);
W2=Karamul(U1,V1);
W1=Karamul(U0+U1,V0+V1);
W1=W1-W0-W2;
W0=concat(W0,vector(L));
W1=concat(vector(M),W1);
W1=concat(W1,vector(M));
W2=concat(vector(L),W2);
return(W0+W1+W2);
);
}
```

```
k=2^12;  
U=vector(k,l,random(100));V=vector(k,l,random(100));  
W1=polmul(U,V);  
W2=karamul(U,V);  
W=sum(l=0,k-1,X^l*U[l+1])*sum(l=0,k-1,X^l*V[l+1]);  
W3=vector(2*k-1,l,polcoeff(W,l-1));
```