TP3

```
html("<H1>Polynôme d'interplotaion de Lagrange</H1>")
html("<B>Prévision d'un temps de calcul lors d'un processus industriel</B>")
```

Polynôme d'interplotaion de Lagrange

Prévision d'un temps de calcul lors d'un processus industriel

```
var('x')
xdata=[0,1,2,3]
fdata=[0,1,4,9]
n=len(xdata)-1
P=0
for i in range(n+1):
    L=1
    for j in range(n+1):
        if i<>j:
            L=L*(x-xdata[j])/(xdata[i]-xdata[j])
    P=P+fdata[i]*L
print "P=",P
print "Apres simplification, P=", expand(P)
A=plot(x^2,0,3,color='red')
show(A+fig)
```

```
P= 1/2*(x - 3)*(x - 2)*x - 2*(x - 3)*(x - 1)*x + 3/2*(x - 2)*(x -
1)*x
Apres simplification, P= x^2
```

```
def Lagrange(f,xdata):
    n=len(xdata)-1
    P=0
    for i in range(n+1):
        L=1
        for j in range(n+1):
            if i<>j:
                L=L*(x-xdata[j])/(xdata[i]-xdata[j])
        P=P+f(xdata[i])*L
    return expand(P)
```

```
Lagrange(x^2,[0,1,2,3])
```

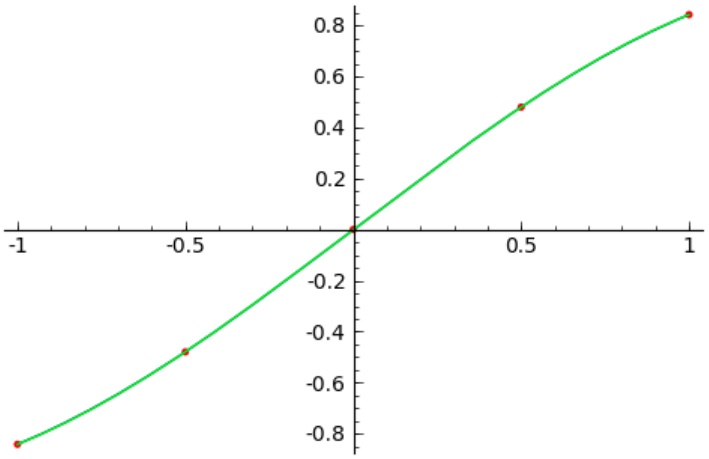
```
P= 1/2*(x - 3)*(x - 2)*x - 2*(x - 3)*(x - 1)*x + 3/2*(x - 2)*(x -
1)*x
Apres simplification, P=
x^2
```

```
html("<B>Estimation de l'erreur</B>")
```

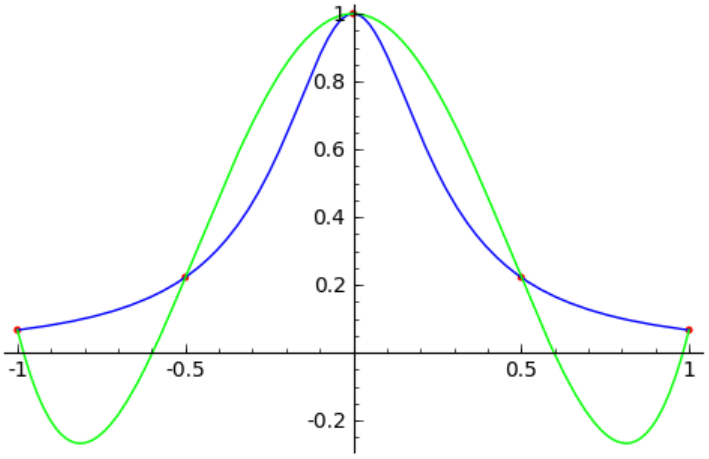
Estimation de l'erreur

```
from pylab import arange
xdata=arange(-1.0,1.1,0.5)
f=sin
P=Lagrange(f,xdata)
R=plot(f,-1,1,rgbcolor=(0,2,1))
Q=plot(P,-1,1,rgbcolor=(0,1,2))
n=len(xdata)-1
s=Graphics()
for i in range(n+1):
    xi=xdata[i]
    fi=f(xdata[i])
    s=s+point((xi,fi),rgbcolor=(1,0,0))
```

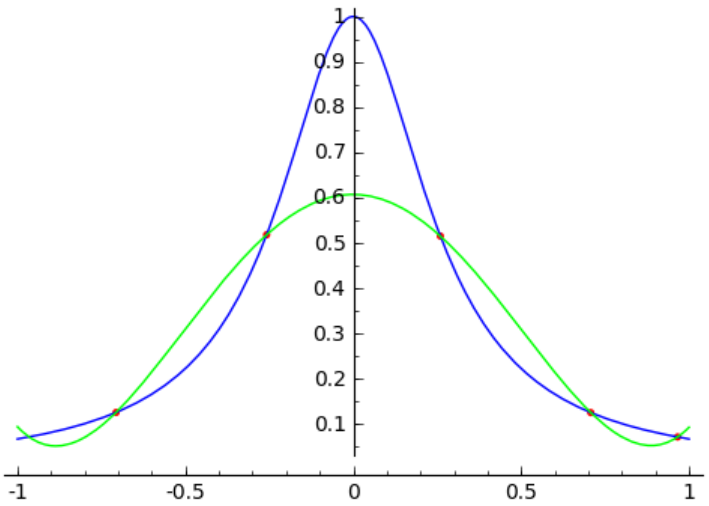
```
R+Q+s
```




```
from pylab import arange
xdata=arange(-1.0,1.1,0.5)
f=1/(1+14*x^2)
P=Lagrange(f,xdata)
R=plot(f,-1,1,rgbcolor=(0,2,1))
Q=plot(P,-1,1,rgbcolor=(0,1,2))
n=len(xdata)-1
s=Graphics()
for i in range(n+1):
    xi=xdata[i]
    fi=f(xdata[i])
    s=s+point((xi,fi),rgbcolor=(1,0,0))
R+Q+s
```




```
a=-1; b=1; n=5
ydata=[simplify((a+b)/2+(b-a)/2*cos((2*k+1)*3.14/(2*n+2))) for k in range(n+1)]
f=1/(1+14*x^2)
P=Lagrange(f,ydata)
A=plot(f,-1,1,rgbcolor=(0,2,1))
B=plot(P,-1,1,rgbcolor=(0,1,2))
n=len(xdata)-1
s=Graphics()
for i in range(n+1):
    yi=ydata[i]
    fi=f(ydata[i])
    s=s+point((yi,fi),rgbcolor=(1,0,0))
A+B+s
```




```
a=-1; b=1; n=13
ydata=[simplify((a+b)/2+(b-a)/2*cos((2*k+1)*3.14/(2*n+2))) for k in range(n+1)]
f=1/(1+14*x^2)
P=Lagrange(f,ydata)
A=plot(f,-1,1,rgbcolor=(0,2,1))
B=plot(P,-1,1,rgbcolor=(0,1,2))
for i in range(n+1):
    yi=ydata[i]
    fi=f(ydata[i])
    s=s+point((yi,fi),rgbcolor=(1,0,0))
A+B+s
```