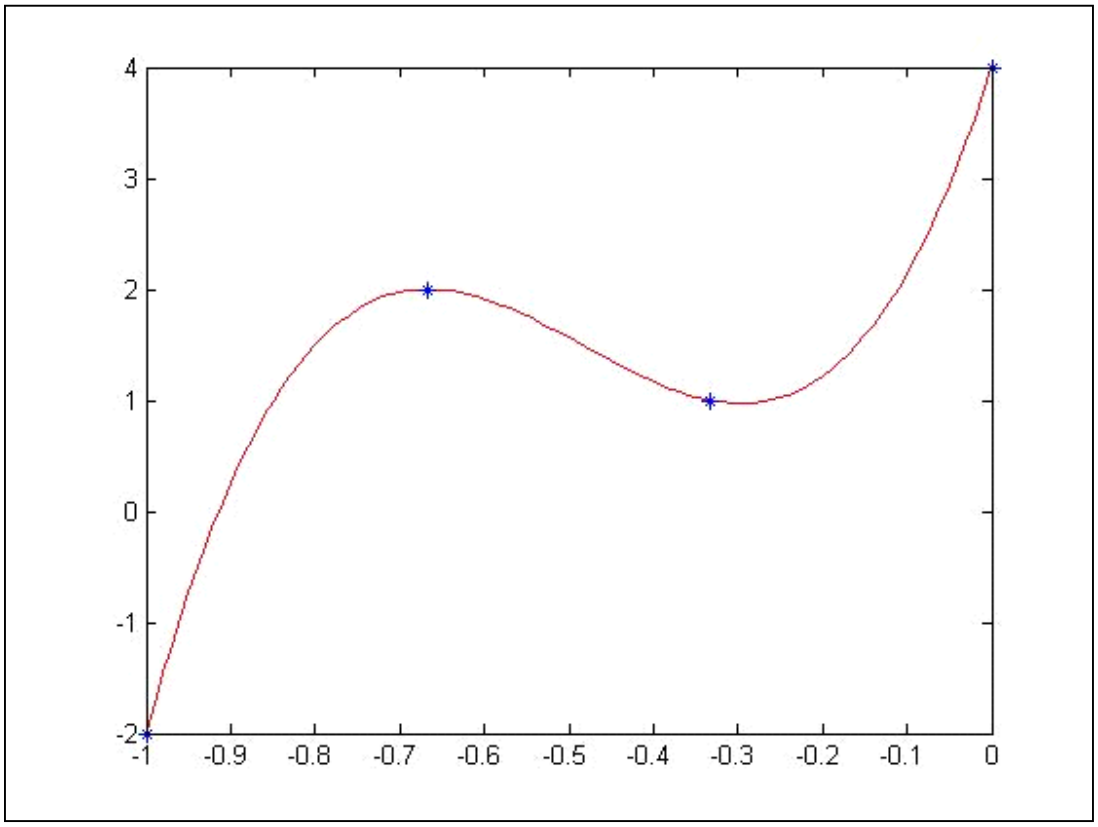
18.02.2016

Geometrie computationala
Laborator1

1. Date punctele x0,x1,x2,x3 si respectiv y0,y1,y2,y3, determinati curba ce trece prin cele 4 puncte, folosind interpolarea Lagrange, si reprezentati grafic aceasta curba.

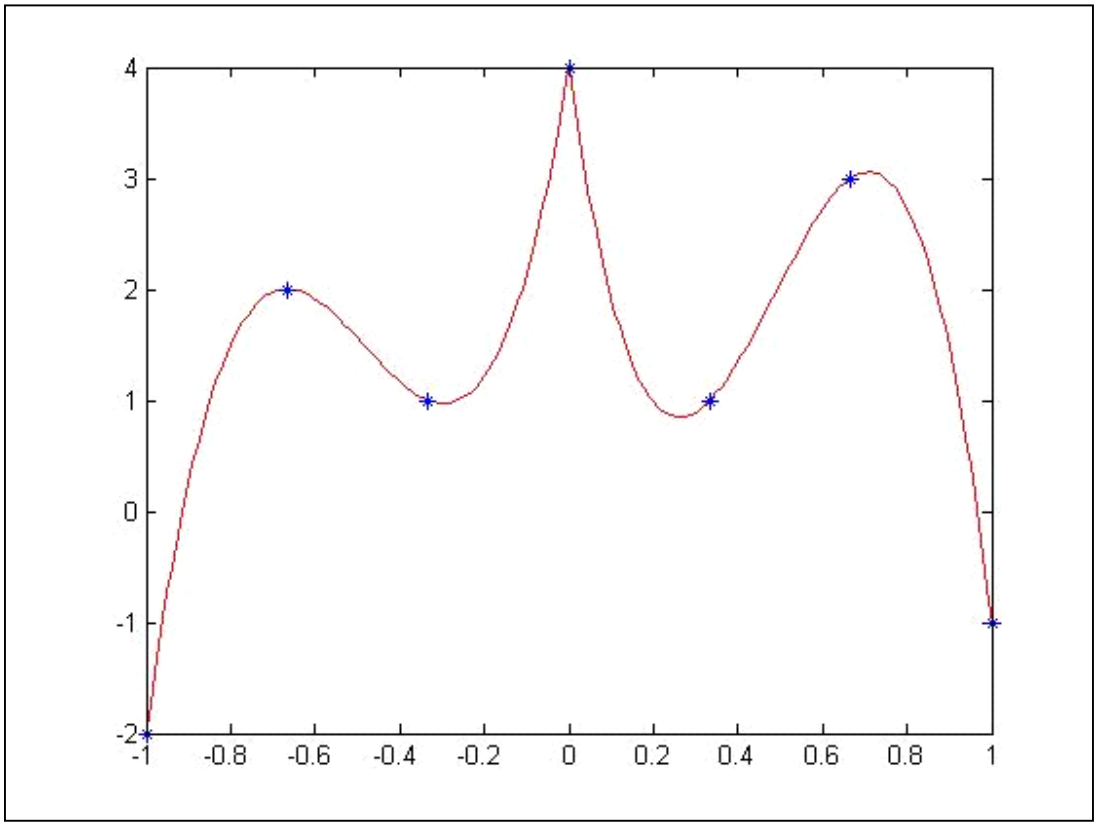
```
clear;

x0=-1;
x1=-2/3;
x2=-1/3;
x3=0;

y0=-2;
y1=2;
y2=1;
y3=4;

h=0.01;
x=x0:h:x3;

n0=(x0-x1)*(x0-x2)*(x0-x3);
L0=((x-x1).*(x-x2).*(x-x3))/n0;

n1=(x1-x0)*(x1-x2)*(x1-x3);
L1=((x-x0).*(x-x2).*(x-x3))/n1;

n2=(x2-x0)*(x2-x1)*(x2-x3);
L2=((x-x0).*(x-x1).*(x-x3))/n2;

n3=(x3-x0)*(x3-x1)*(x3-x2);
L3=((x-x0).*(x-x1).*(x-x2))/n3;

L=y0*L0+y1*L1+y2*L2+y3*L3;
plot(x,L,'r')
hold on
plot(x0,y0,'*b');
plot(x1,y1,'*b');
plot(x2,y2,'*b');
plot(x3,y3,'*b');
```



2. Fie punctele x0=-1,x1=-2/3,x2=-1/3,x3=0,x4=1/3,x5=2/3,x6=1 si repectiv y0=-2,y1=2,y2=1,y3=4,y4=1,y5=3,y6=-1. Determinati curba ce uneste cele 7 puncte folosind 2 interpolari Lagrange: prima folosind ca noduri primele 4 puncte(x0,x1,x2,x3), iar a 2-a folosind ca noduri ultimele 4 puncte (x3,x4,x5,x6). Observati ca, se obtine o curba care este continua pe intervalul [x0,x6], dar nu e este derivabila in x3. Reprezentati grafic curba.

```
clear;

x0=-1;
x1=-2/3;
x2=-1/3;
x3=0;

y0=-2;
y1=2;
y2=1;
y3=4;

h=0.01;
x=x0:h:x3;
```

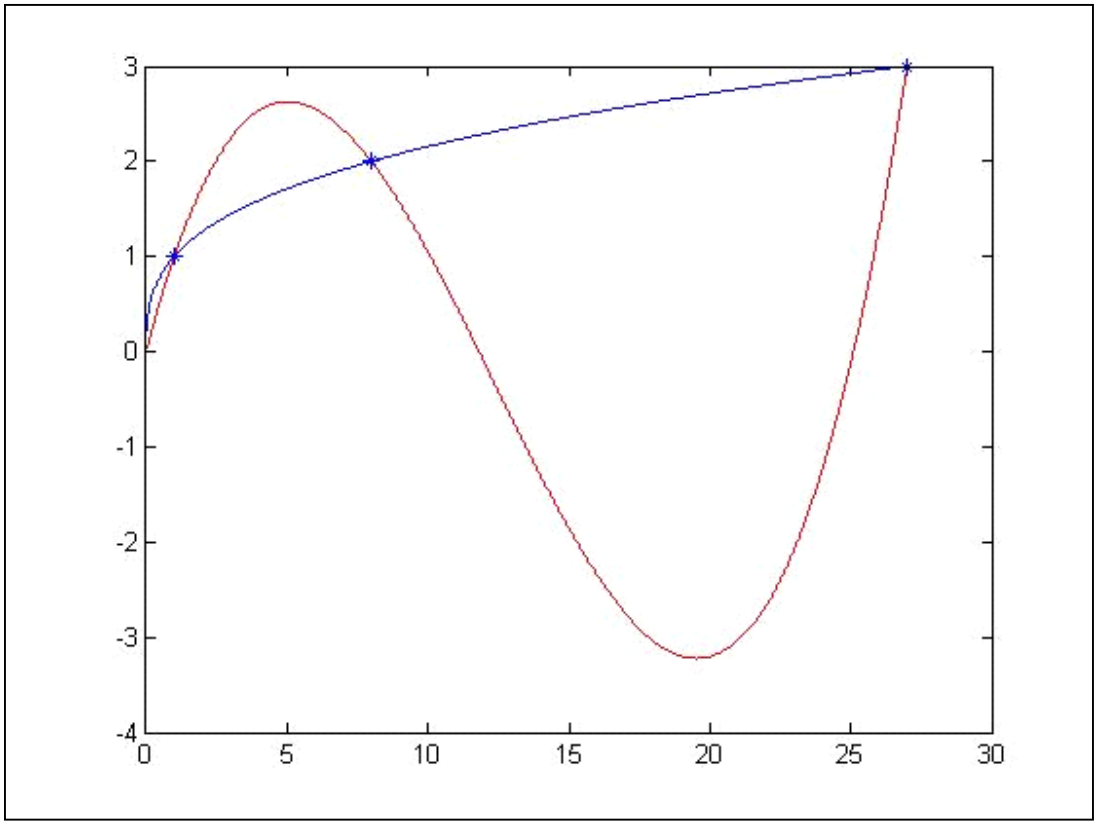
```
n0=(x0-x1)*(x0-x2)*(x0-x3);
L0=((x-x1).*(x-x2).*(x-x3))/n0;

n1=(x1-x0)*(x1-x2)*(x1-x3);
L1=((x-x0).*(x-x2).*(x-x3))/n1;

n2=(x2-x0)*(x2-x1)*(x2-x3);
L2=((x-x0).*(x-x1).*(x-x3))/n2;

n3=(x3-x0)*(x3-x1)*(x3-x2);
L3=((x-x0).*(x-x1).*(x-x2))/n3;

L=y0*L0+y1*L1+y2*L2+y3*L3;
plot(x,L,'r')
hold on
plot(x0,y0,'*b');
plot(x1,y1,'*b');
plot(x2,y2,'*b');
plot(x3,y3,'*b');

x0=0;
x1=1/3;
x2=2/3;
x3=1;

y0=4;
y1=1;
y2=3;
y3=-1;

h=0.01;
x=x0:h:x3;

n0=(x0-x1)*(x0-x2)*(x0-x3);
L0=((x-x1).*(x-x2).*(x-x3))/n0;

n1=(x1-x0)*(x1-x2)*(x1-x3);
L1=((x-x0).*(x-x2).*(x-x3))/n1;

n2=(x2-x0)*(x2-x1)*(x2-x3);
L2=((x-x0).*(x-x1).*(x-x3))/n2;

n3=(x3-x0)*(x3-x1)*(x3-x2);
L3=((x-x0).*(x-x1).*(x-x2))/n3;

L=y0*L0+y1*L1+y2*L2+y3*L3;
plot(x,L,'r')
hold on
plot(x0,y0,'*b');
plot(x1,y1,'*b');
plot(x2,y2,'*b');
plot(x3,y3,'*b');
```



3. Pentru punctele x0=0,x1=1,x2=8,x3=27,y0=0,y1=1,y2=2,y3=3 determinati interpolatoarea Lagrange. Comparati curba interpolatoare cu f(x)=(x)^(1/3).

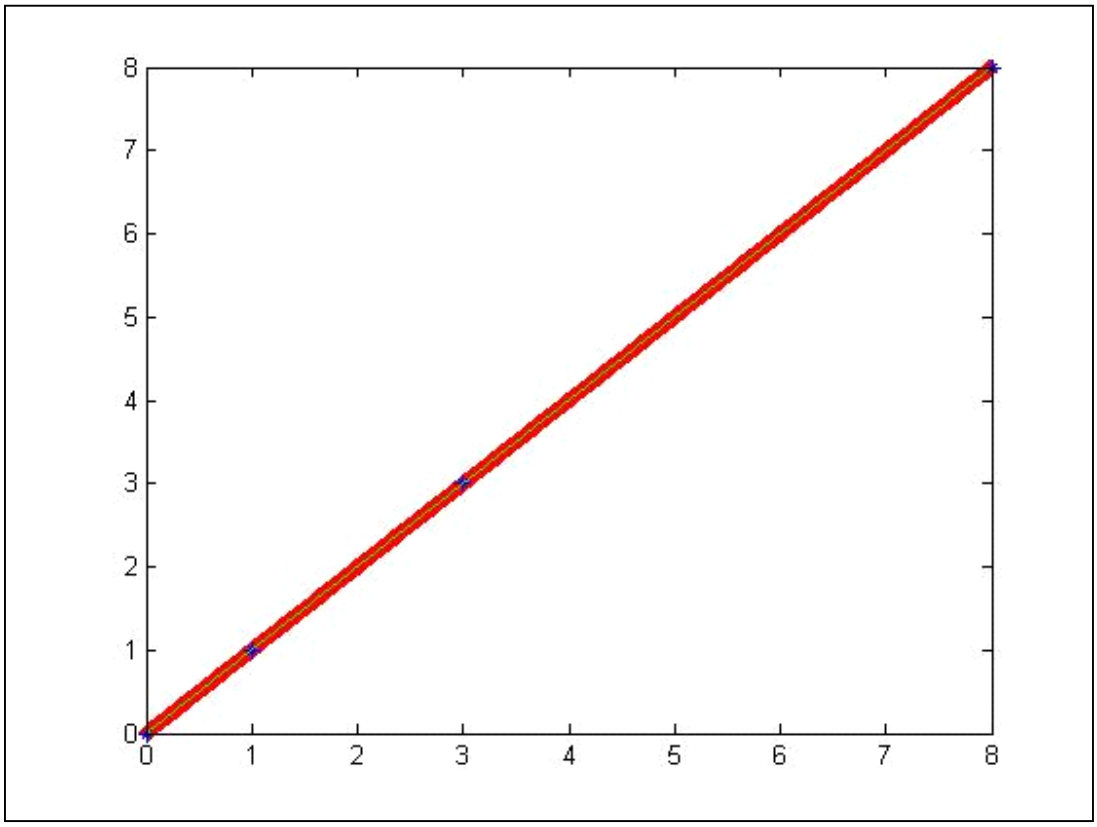
```
clear;

x0=0;
x1=1;
x2=8;
x3=27;

y0=0;
y1=1;
y2=2;
y3=3;

h=0.01;
x=x0:h:x3;

n0=(x0-x1)*(x0-x2)*(x0-x3);
```

```
L0=((x-x1).*(x-x2).*(x-x3))/n0;

n1=(x1-x0)*(x1-x2)*(x1-x3);
L1=((x-x0).*(x-x2).*(x-x3))/n1;

n2=(x2-x0)*(x2-x1)*(x2-x3);
L2=((x-x0).*(x-x1).*(x-x3))/n2;

n3=(x3-x0)*(x3-x1)*(x3-x2);
L3=((x-x0).*(x-x1).*(x-x2))/n3;

L=y0*L0+y1*L1+y2*L2+y3*L3;
plot(x,L,'r')
hold on
plot(x0,y0,'*b');
plot(x1,y1,'*b');
plot(x2,y2,'*b');
plot(x3,y3,'*b');

plot(x,x.^(1/3),'b')
```



4. Studiati interpolarea Lagrange pentru 4 puncte coliniare.

```
clear;

x0=0;
x1=1;
x2=3;
x3=8;

y0=0;
y1=1;
y2=3;
y3=8;

h=0.01;
x=x0:h:x3;

n0=(x0-x1)*(x0-x2)*(x0-x3);
L0=((x-x1).*(x-x2).*(x-x3))/n0;

n1=(x1-x0)*(x1-x2)*(x1-x3);
L1=((x-x0).*(x-x2).*(x-x3))/n1;

n2=(x2-x0)*(x2-x1)*(x2-x3);
L2=((x-x0).*(x-x1).*(x-x3))/n2;

n3=(x3-x0)*(x3-x1)*(x3-x2);
L3=((x-x0).*(x-x1).*(x-x2))/n3;

L=y0*L0+y1*L1+y2*L2+y3*L3;
plot(x,L,'-r')
hold on
plot(x0,y0,'*b');
plot(x1,y1,'*b');
plot(x2,y2,'*b');
plot(x3,y3,'*b');


plot(x,x,'--b')
```




```
clear;

syms x x0 x1 x2 x3

n0=(x0-x1)*(x0-x2)*(x0-x3);
L0=((x-x1)*(x-x2)*(x-x3))/n0;

n1=(x1-x0)*(x1-x2)*(x1-x3);
L1=((x-x0)*(x-x2)*(x-x3))/n1;

n2=(x2-x0)*(x2-x1)*(x2-x3);
L2=((x-x0)*(x-x1)*(x-x3))/n2;

n3=(x3-x0)*(x3-x1)*(x3-x2);
L3=((x-x0)*(x-x1)*(x-x2))/n3;

f=x0*L0+x1*L1+x2*L2+x3*L3
```

>> simplify (f)

ans =

x