```
(*
Scrieti un program care sa ne furnizeze
 polinoamele Lagrange de baza pentru un set de noduri date.
*)

X = {x0, x1, x2, x3};

n = Length[X];

For[i = 1, i ≤ n, i++,
 a = 1;
 For[j = 1, j ≤ n, j++,
  If[j ≠ i, a = a * (x - X[[j]])/(X[[i]] - X[[j]])]];
 L[i, x_] = a;
 Print[L[i, x]]]
```

$$\frac{(x-x1)(x-x2)(x-x3)}{(x0-x1)(x0-x2)(x0-x3)}$$

$$\frac{(x-x0)(x-x2)(x-x3)}{(-x0+x1)(x1-x2)(x1-x3)}$$

$$\frac{(x-x0)(x-x1)(x-x3)}{(-x0+x2)(-x1+x2)(x2-x3)}$$

$$\frac{(x-x0)(x-x1)(x-x2)}{(-x0+x3)(-x1+x3)(-x2+x3)}$$

```
L[1, x]
```

$$\frac{(x-x1)(x-x2)(x-x3)}{(x0-x1)(x0-x2)(x0-x3)}$$

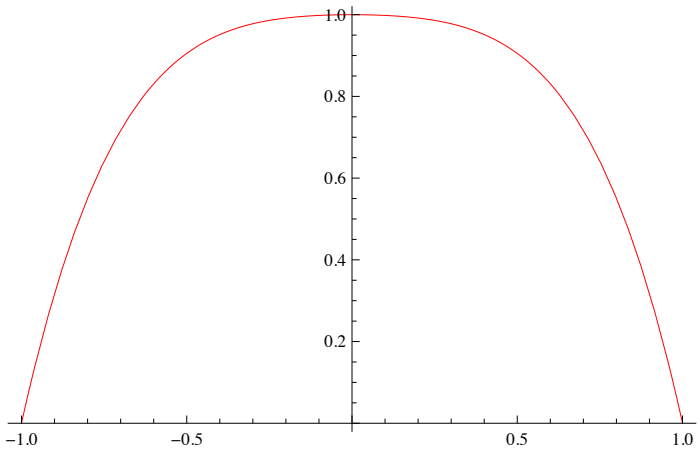
```
Sum[X[[i]] L[i, x], {i, 1, n}] // Simplify
```

x

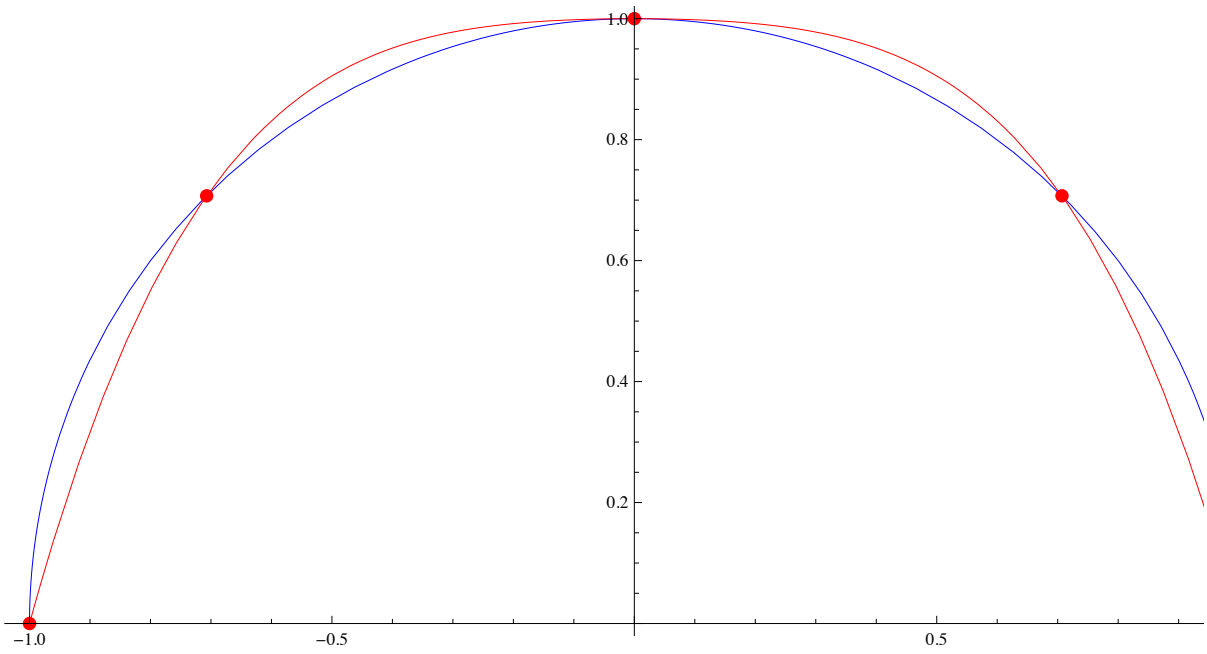
```
Sum[L[i, x], {i, 1, n}] // Simplify
```

1

```
X = {-1, -1/Sqrt[2], 0, 1/Sqrt[2], 1};

Y = {0, 1/Sqrt[2], 1, 1/Sqrt[2], 0};

n = Length[X];

For[i = 1, i ≤ n, i++,
 a = 1;
 For[j = 1, j ≤ n, j++,
  If[j ≠ i, a = a * (x - X[[j]])/(X[[i]] - X[[j]])]];
 L[i, x_] = a]

c[s_] := {Cos[s], Sin[ s]};

cerc = ParametricPlot[c[s], {s, 0, Pi}, PlotStyle → Blue];

Table[A[i], {i, 1, n}];

For[i = 1, i ≤ n, i++,
  A[i] = c[X[[i]] Pi]];
PA = Graphics[{Red, PointSize[Large], Point[c[0]]}];
PB = Graphics[{Red, PointSize[Large], Point[c[Pi / 4]]}];
PC = Graphics[{Red, PointSize[Large], Point[c[Pi / 2]]}];
PD = Graphics[{Red, PointSize[Large], Point[c[3 Pi / 4]]}];
PE = Graphics[{Red, PointSize[Large], Point[c[Pi]]}];

L[x_] := Simplify[Sum[(L[i, x] Y[[i]]), {i, 1, n}]]

Lg = Plot[L[x], {x, X[[1]], X[[n]]}, PlotStyle → Red]
```



```
Show[cerc, Lg, PA, PB, PC, PD, PE]
```



```
T = {0, 1 / 3, 2 / 3, 1};

n = Length[T];

For[i = 1, i ≤ n, i++,
 a = 1;
 For[j = 1, j ≤ n, j++,
  If[j ≠ i, a = a * (t - T[[j]]) / (T[[i]] - T[[j]])]];
 L[i, t_] = a;
 Print[L[i, t]]]
```

$$\frac{9}{2}(1-t)\left(-\frac{2}{3}+t\right)\left(-\frac{1}{3}+t\right)$$

$$\frac{27}{2}(-1+t)\left(-\frac{2}{3}+t\right)t$$

$$-\frac{27}{2}(-1+t)\left(-\frac{1}{3}+t\right)t$$

$$\frac{9}{2}\left(-\frac{2}{3}+t\right)\left(-\frac{1}{3}+t\right)t$$

```
c[s_] := {Cos[2 s Pi], Sin[2 s Pi], s};

Table[A[i], {i, 1, n}];

For[i = 1, i ≤ n, i++, A[i] = c[T[[i]]];
 Print[A[i]]]
```

$$\{1, 0, 0\}$$

$$\left\{-\frac{1}{2}, \frac{\sqrt{3}}{2}, \frac{1}{3}\right\}$$

$$\left\{-\frac{1}{2}, -\frac{\sqrt{3}}{2}, \frac{2}{3}\right\}$$

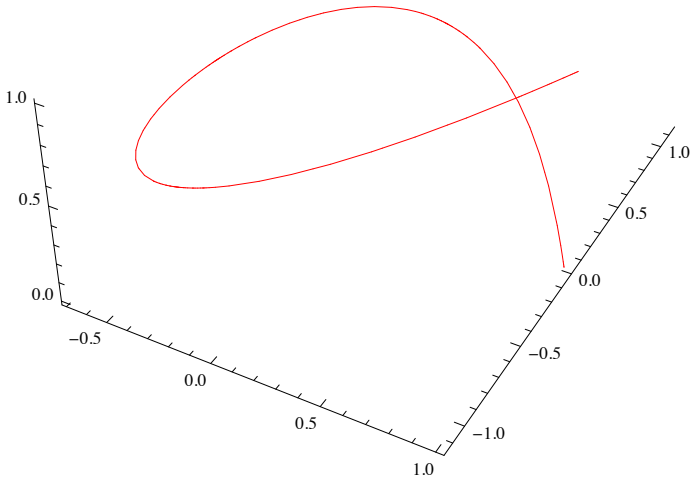
$$\{1, 0, 1\}$$

```
(*
A0=c[t0];A1=c[t1];A2=c[t2];A3=c[t3]
*)

L[t_] := Simplify[∑_{i=1}^{n} (L[i, t] A[i])]

L[t]
```

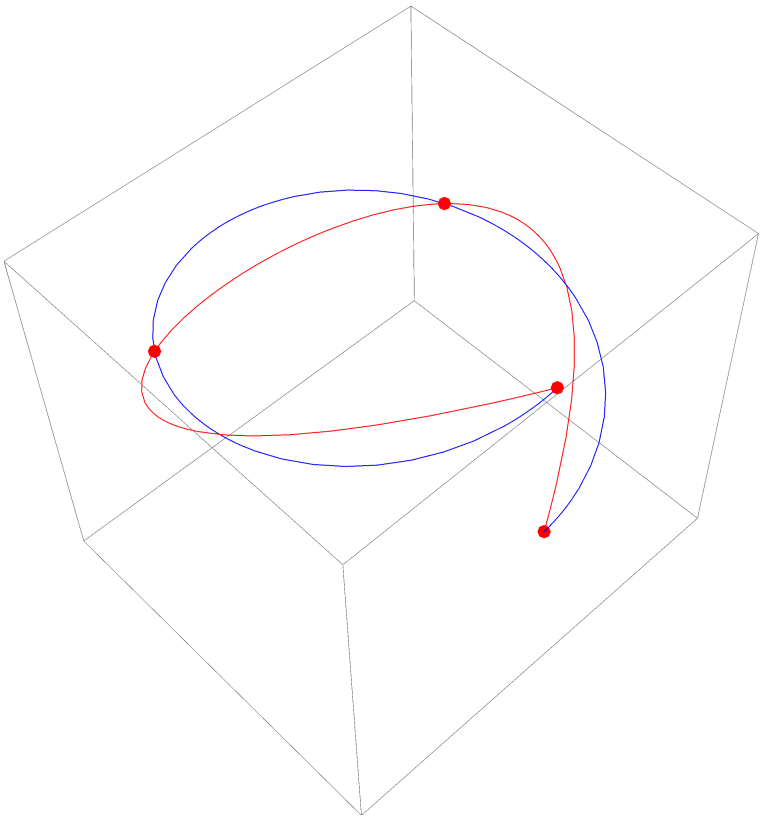
$$\left\{\frac{1}{4}\left(4-27t+27t^2\right), \frac{27}{4}\sqrt{3}\,(-1+t)\,t\,(-1+2t), t\right\}$$

```
PA = Graphics3D[{Red, PointSize[Large], Point[c[T[[1]]]]}];
PB = Graphics3D[{Red, PointSize[Large], Point[c[T[[2]]]]}];
PC = Graphics3D[{Red, PointSize[Large], Point[c[T[[3]]]]}];
PD = Graphics3D[{Red, PointSize[Large], Point[c[T[[4]]]]}];

El = ParametricPlot3D[c[s], {s, 0, 1}, PlotStyle → Blue, Boxed → False];
```

```
Lg = ParametricPlot3D[L[t], {t, 0, 1}, PlotStyle → Red, Boxed → False]
```

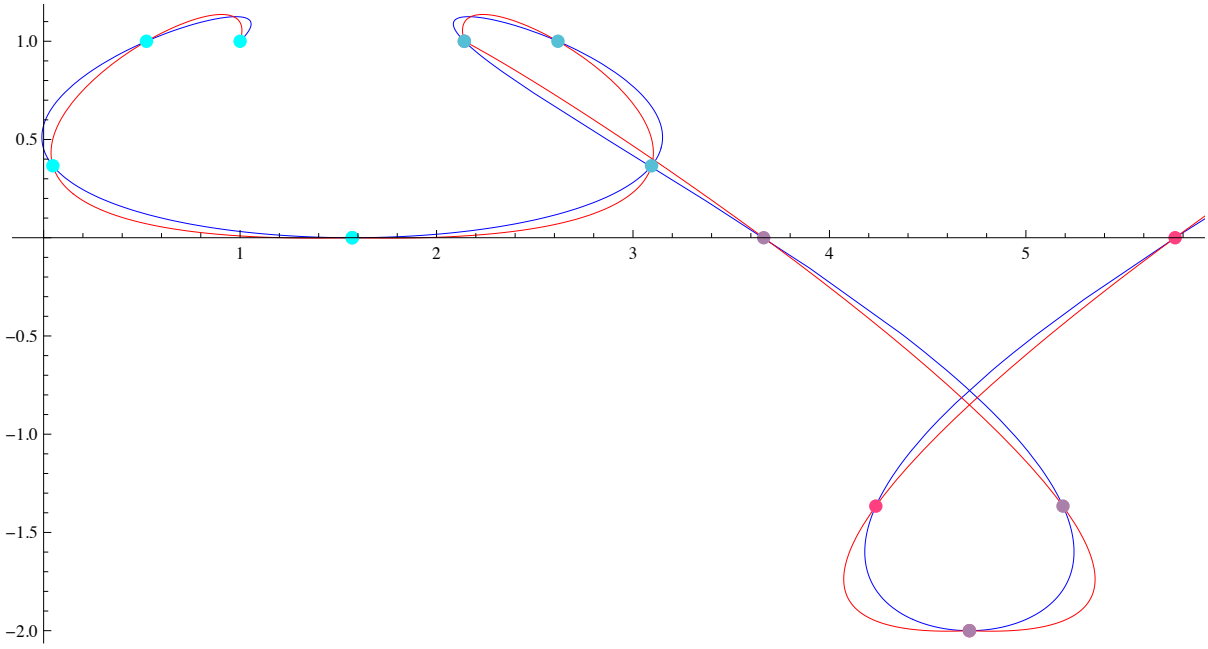



```
S = Graphics3D[{Opacity[0], Sphere[{0, 0, 0}, 1]}];

Show[S, Lg, El, PA, PB, PC, PD]
```



```
T = {0, 1 / 3, 2 / 3, 1};

n = Length[T];

For[i = 1, i ≤ n, i++,
 a = 1;
 For[j = 1, j ≤ n, j++,
  If[j ≠ i, a = a * (t - T[[j]]) / (T[[i]] - T[[j]])]];
 L[i, t_] = a]

c[s_] := {2 Cos[s], 2 Sin[ s]};

c[s_] := {5 Cos[s], 3 Sin[ s]};

c[s_] := {3 Cos[s] + 1, 2 Sin[ s] + s};

c[s_] := {Cos[2 s], Sin[s] + Cos[s]};

c[s_] := {2 s + Cos[s], Sin[s] + Cos[2 s]};

c[s_] := {s + Cos[3 s], Sin[s] + Cos[2 s]};

cerc = ParametricPlot[c[s], {s, 0, 2 Pi}, PlotStyle → Blue];

Table[A[i], {i, 1, n}];

For[k = 0, k ≤ 3, k++,
 For[i = 1, i ≤ n, i++,
  A[i] = c[T[[i]] Pi / 2 + k / 2 Pi]];
 PA[k] = Graphics[{RGBColor[k / 3, 1 - k / 4, 1 - k / 6],
    PointSize[Large], Point[c[T[[1]] Pi / 2 + k / 2 Pi]]}];
 PB[k] = Graphics[{RGBColor[k / 3, 1 - k / 4, 1 - k / 6],
    PointSize[Large], Point[c[T[[2]] Pi / 2 + k / 2 Pi]]}];
 PC[k] = Graphics[{RGBColor[k / 3, 1 - k / 4, 1 - k / 6],
    PointSize[Large], Point[c[T[[3]] Pi / 2 + k / 2 Pi]]}];
 PD[k] = Graphics[{RGBColor[k / 3, 1 - k / 4, 1 - k / 6],
    PointSize[Large], Point[c[T[[4]] Pi / 2 + k / 2 Pi]]}];
 L[t_] := Simplify[Sum[(L[i, t] A[i]), {i, 1, n}]];
 Lg[k] = ParametricPlot[L[t], {t, 0, 1}, PlotStyle → Red]]
```

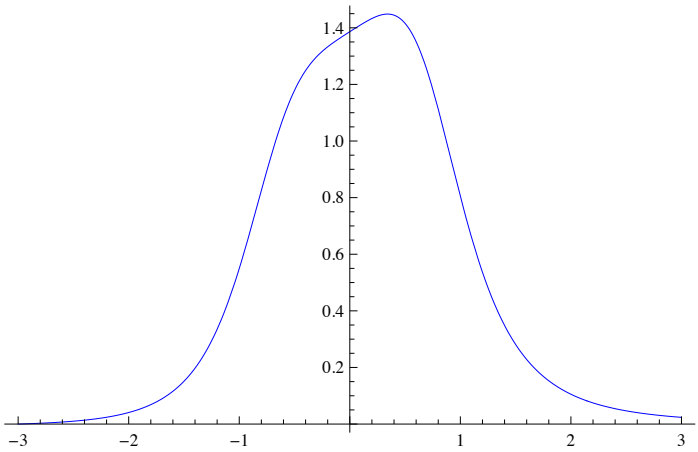
```
Show[cerc, Lg[1], Lg[2], Lg[3], Lg[0], PA[1], PA[2], PA[3], PA[0], PB[1],
 PB[2], PB[3], PB[0], PC[1], PC[2], PC[3], PC[0], PD[1], PD[2], PD[3], PD[0]]
```



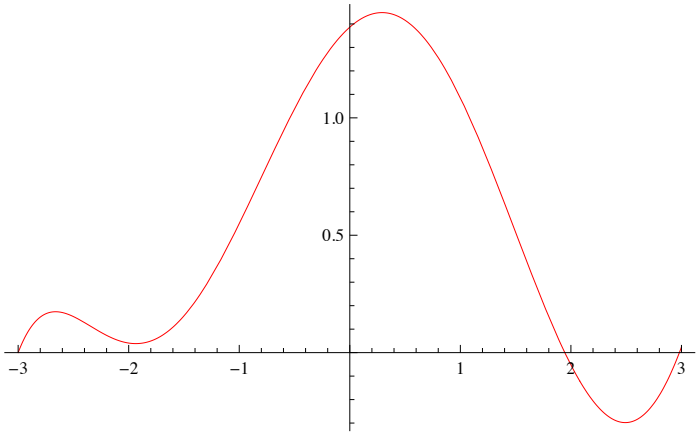
```
X = {-3, -2, -1, 0, 0.5, 1.8, 3};

n = Length[X];

For[i = 1, i ≤ n, i++,
 a = 1;
 For[j = 1, j ≤ n, j++,
  If[j ≠ i, a = a * (x - X[[j]])/(X[[i]] - X[[j]])]];
 L[i, x_] = a]

L[2, x] // Expand
```

$$0.0852632\,x - 0.132632\,x^2 - 0.132632\,x^3 + 0.109474\,x^4 + 0.0136842\,x^5 - 0.0105263\,x^6$$

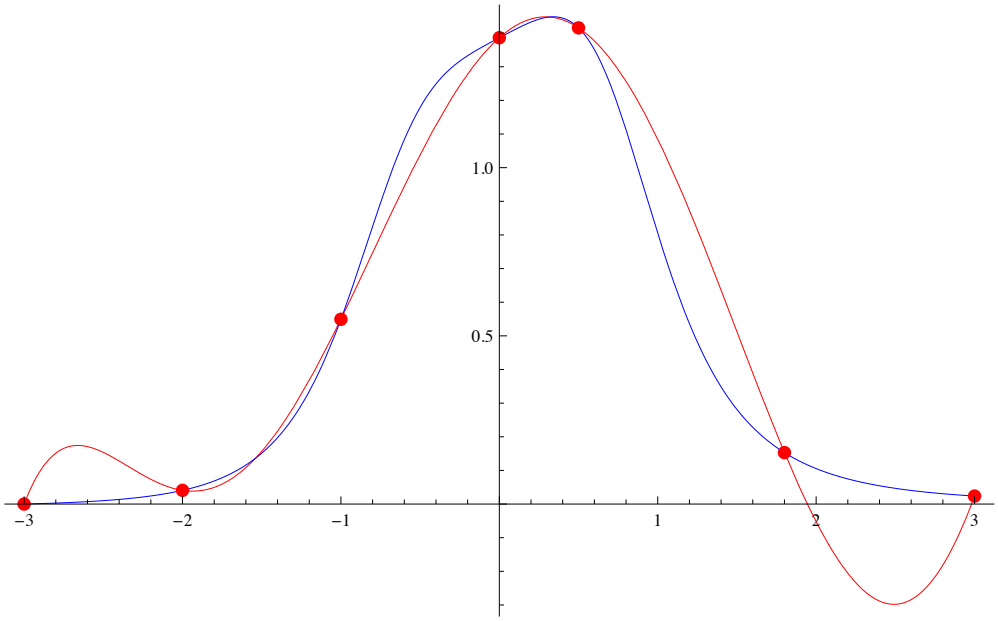
```
f[x_] := (2 x + 1)/(x^4 + 1);

f[x_] := Log[x + 4]/(x^4 + 1);

(*
A0=c[t0];A1=c[t1];A2=c[t2];A3=c[t3]
*)

L[x_] := Simplify[Sum[(L[i, x] f[X[[i]]]), {i, 1, n}]]

PA = Graphics[{Red, PointSize[Large], Point[{X[[1]], f[X[[1]]]}]}];
PB = Graphics[{Red, PointSize[Large], Point[{X[[2]], f[X[[2]]]}]}];
PC = Graphics[{Red, PointSize[Large], Point[{X[[3]], f[X[[3]]]}]}];
PD = Graphics[{Red, PointSize[Large], Point[{X[[4]], f[X[[4]]]}]}];
PE = Graphics[{Red, PointSize[Large], Point[{X[[5]], f[X[[5]]]}]}];
PF = Graphics[{Red, PointSize[Large], Point[{X[[6]], f[X[[6]]]}]}];
PG = Graphics[{Red, PointSize[Large], Point[{X[[7]], f[X[[7]]]}]}];

curba = Plot[f[x], {x, X[[1]], X[[n]]}, PlotStyle → Blue]
```



```
Lg = Plot[L[x], {x, X[[1]], X[[n]]}, PlotStyle → Red]
```




```
Show[Lg, curba, PA, PB, PC, PD, PE, PF, PG]
```

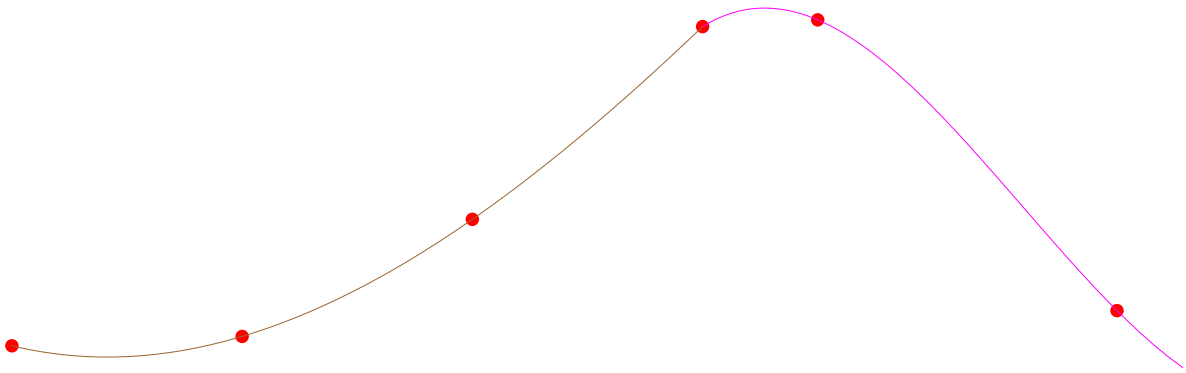



```
X = {-3, -2, -1, 0};

n = Length[X];

For[i = 1, i ≤ n, i++,
 a = 1;
 For[j = 1, j ≤ n, j++,
  If[j ≠ i, a = a * (x - X[[j]]) / (X[[i]] - X[[j]])]];
 L[i, x_] = a]

L[2, x] // Expand
```

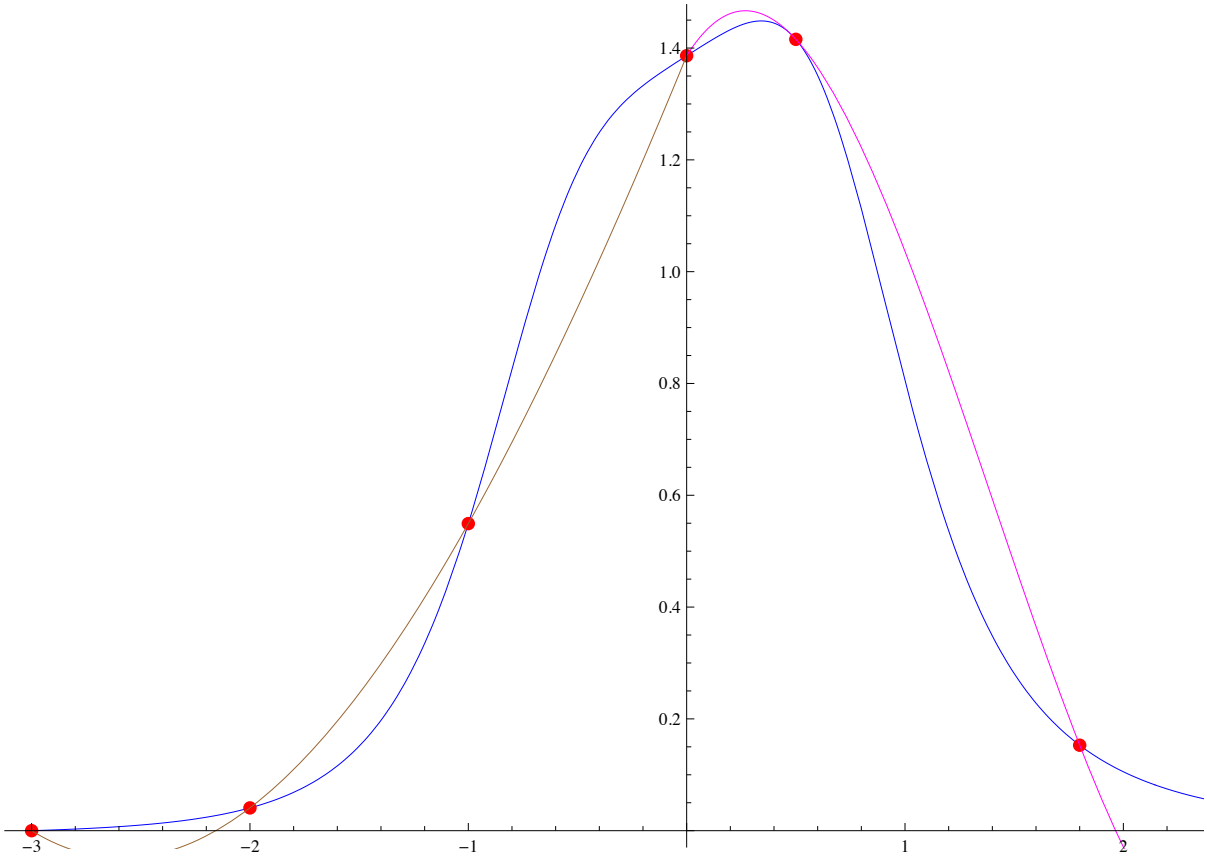
$$\frac{3\,x}{2} + 2\,x^2 + \frac{x^3}{2}$$

```
Lstg[x_] := Simplify[∑_{i=1}^{n} (L[i, x] f[X[[i]]])]
```

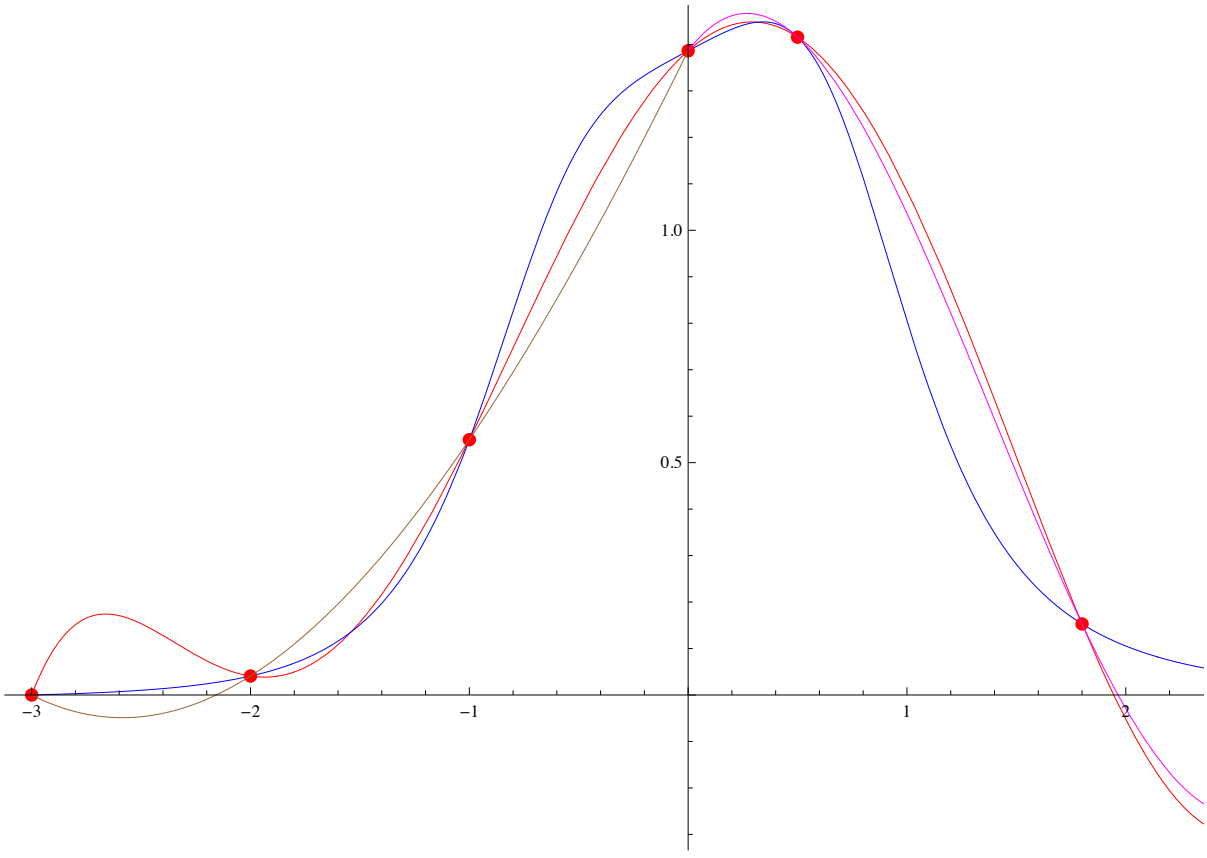
```
Cstg = Plot[Lstg[x], {x, X[[1]], X[[n]]}, PlotStyle → Brown];

X = {0, 0.5, 1.8, 3};

n = Length[X];

For[i = 1, i ≤ n, i++,
 a = 1;
 For[j = 1, j ≤ n, j++,
  If[j ≠ i, a = a * (x - X[[j]]) / (X[[i]] - X[[j]])]];
 L[i, x_] = a]

Ldr[x_] := Simplify[∑_{i=1}^{n} (L[i, x] f[X[[i]]])]

Cdr = Plot[Lstg[x], {x, X[[1]], X[[n]]}, PlotStyle → Magenta];

Show[PA, PB, PC, PD, PE, PF, PG, Cstg, Cdr]
```



```
Show[curba, PA, PB, PC, PD, PE, PF, PG, Cstg, Cdr]
```




```
Show[Lg, curba, PA, PB, PC, PD, PE, PF, PG, Cstg, Cdr]
```



TEMA :
Folosind interpolarea Lagrange (pe [0, 1]), sa se interpoleze punctele :
1 :
(R, 0), (R cos π / 6, R sin π / 6), (R cos 2 π / 6, R sin 2 π / 6),
(R cos 3 π / 6, R sin 3 π / 6) = (0, R),
2 :
(0, R), (R cos 4 π / 6, R sin 4 π / 6), (R cos 5 π / 6, R sin 5 π / 6),
(R cos 6 π / 6, R sin 6 π / 6) = (-R, 0),
3 :
(-R, 0), (R cos 7 π / 6, R sin 7 π / 6),
(R cos 8 π / 6, R sin 8 π / 6), (R cos 9 π / 6, R sin 9 π / 6) = (0, -R),
4 :
(0, -R), (R cos 10 π / 6, R sin 10 π / 6),
(R cos 11 π / 6, R sin 11 π / 6), (R cos 12 π / 6, R sin 12 π / 6) = (R, 0),