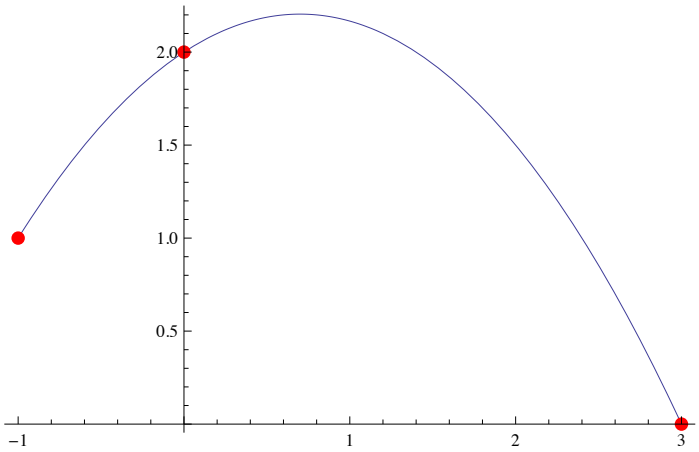
```
(* interpolare Lagrange - forma explicita *)

x0 = 0;
x1 = -1;
x2 = 3;

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

L0[x_] := (x - x1) (x - x2) / (x0 - x1) (x0 - x2);
L1[x_] := (x - x0) (x - x2) / (x1 - x0) (x1 - x2);
L2[x_] := (x - x0) (x - x1) / (x2 - x0) (x2 - x1);

Simplify[L[x]]
```

$$\frac{1}{12}\left(24 + 7\,x - 5\,x^2\right)$$

```
L[x_] := y0 L0[x] + y1 L1[x] + y2 L2[x]

PA = Graphics[{Red, PointSize[Large], Point[{0, 2}]}];
PB = Graphics[{Red, PointSize[Large], Point[{-1, 1}]}];
PC = Graphics[{Red, PointSize[Large], Point[{3, 0}]}];

lagr1 = Plot[L[x], {x, -1, 3}];

Show[lagr1, PA, PB, PC]
```




```
(* interpolare Lagrange - forma parametrica *)

t0 = 0;
t1 = 1 / 2;
t2 = 1;

Lt0[t_] := (t - t1) (t - t2) / (t0 - t1) (t0 - t2);
Lt1[t_] := (t - t0) (t - t2) / (t1 - t0) (t1 - t2);
Lt2[t_] := (t - t0) (t - t1) / (t2 - t0) (t2 - t1);
```

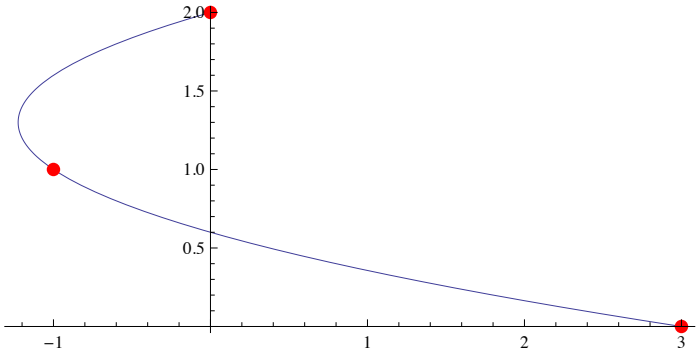
```
Lt[t_] := Lt0[t] {x0, y0} + Lt1[t] {x1, y1} + Lt2[t] {x2, y2}
```

```
Lt[t] // Expand
```

$$\{-7\,t+10\,t^2,\ 2-2\,t\}$$

```
c1 = ParametricPlot[Lt[t], {t, t0, t2}];
```

```
Show[c1, PA, PB, PC]
```




```
t0 = -1;
t1 = 1;
t2 = 2;
```

$$\text{Lt0}[t\_] := \frac{(t-t1)\,(t-t2)}{(t0-t1)\,(t0-t2)};$$

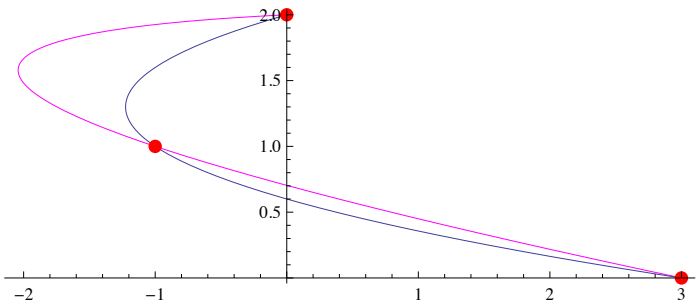
$$\text{Lt1}[t\_] := \frac{(t-t0)\,(t-t2)}{(t1-t0)\,(t1-t2)};$$

$$\text{Lt2}[t\_] := \frac{(t-t0)\,(t-t1)}{(t2-t0)\,(t2-t1)};$$

```
Lt[t_] := Lt0[t] {0, y0} + Lt1[t] {x1, y1} + Lt2[t] {x2, y2}
```

```
c2 = ParametricPlot[Lt[t], {t, t0, t2}, PlotStyle → Magenta];
```

```
Show[c2, c1, PA, PB, PC]
```

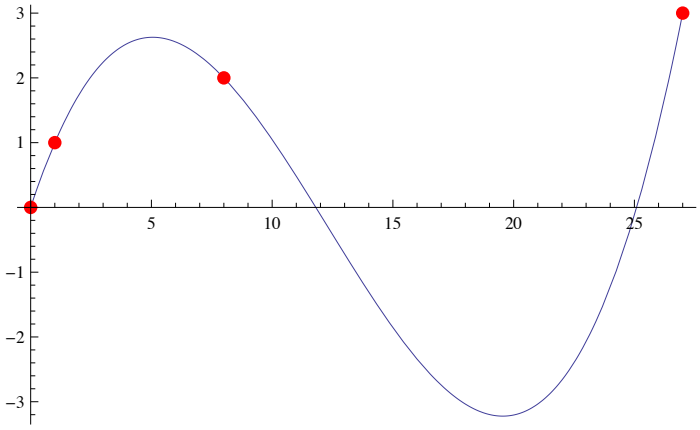



```
t0 = -1;
t1 = 1;
t2 = 3;
```

```
(* interpolare Lagrange de grad 3 - forma explicita *)

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

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

L0[x_] := (x - x1) (x - x2) (x - x3) / ((x0 - x1) (x0 - x2) (x0 - x3));
L1[x_] := (x - x0) (x - x2) (x - x3) / ((x1 - x0) (x1 - x2) (x1 - x3));
L2[x_] := (x - x0) (x - x1) (x - x3) / ((x2 - x0) (x2 - x1) (x2 - x3));
L3[x_] := (x - x0) (x - x1) (x - x2) / ((x3 - x0) (x3 - x1) (x3 - x2));

L[x] // Simplify
```

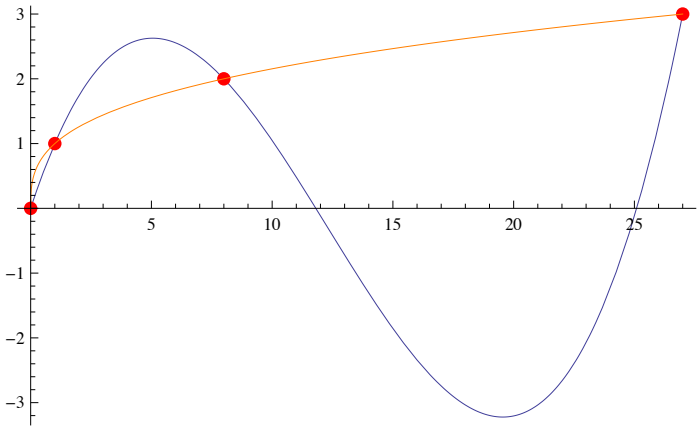
$$\frac{x\left(70\,825 - 8820\,x + 239\,x^2\right)}{62\,244}$$

```
L[x_] := y0 L0[x] + y1 L1[x] + y2 L2[x] + y3 L3[x]

PA = Graphics[{Red, PointSize[Large], Point[{x0, y0}]}];
PB = Graphics[{Red, PointSize[Large], Point[{x1, y1}]}];
PC = Graphics[{Red, PointSize[Large], Point[{x2, y2}]}];
PD = Graphics[{Red, PointSize[Large], Point[{x3, y3}]}];

lagr1 = Plot[L[x], {x, x0, x3}];

Show[lagr1, PA, PB, PC, PD]
```

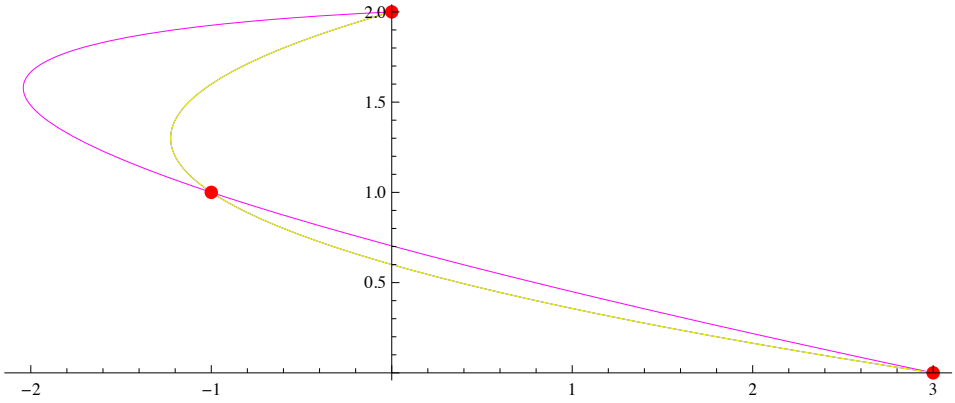



```
f[x_] := ∛x ;

grafic = Plot[f[x], {x, x0, x3}, PlotStyle → Orange];
```

```
Show[lagr1, PA, PB, PC, PD, grafic]
```

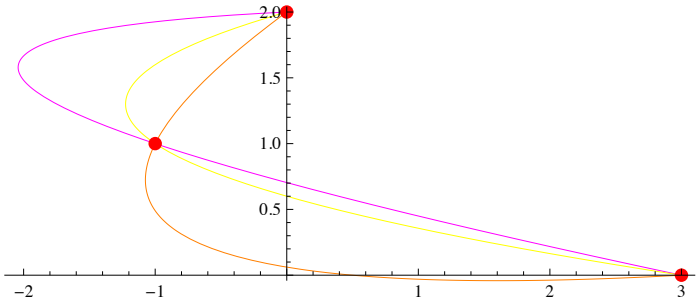


```
Lt0[t_] := (t - t1) (t - t2) / ((t0 - t1) (t0 - t2));
Lt1[t_] := (t - t0) (t - t2) / ((t1 - t0) (t1 - t2));
Lt2[t_] := (t - t0) (t - t1) / ((t2 - t0) (t2 - t1));

Lt[t_] := Lt0[t] {0, y0} + Lt1[t] {x1, y1} + Lt2[t] {x2, y2}

c3 = ParametricPlot[Lt[t], {t, t0, t2}, PlotStyle → Yellow];

Show[c2, c1, c3, PA, PB, PC]
```




```
(*
        c3 si c1 se suprapun!!!
    Diviziunile:
         0 < 1/2 < 1
        -1 < 1 < 3
*)

t0 = -1;
t1 = 0;
t2 = 3;

Lt0[t_] := (t - t1) (t - t2) / ((t0 - t1) (t0 - t2));
Lt1[t_] := (t - t0) (t - t2) / ((t1 - t0) (t1 - t2));
Lt2[t_] := (t - t0) (t - t1) / ((t2 - t0) (t2 - t1));

Lt[t_] := Lt0[t] {x0, y0} + Lt1[t] {x1, y1} + Lt2[t] {x2, y2}

c4 = ParametricPlot[Lt[t], {t, t0, t2}, PlotStyle → Orange];
```

```
Show[c2, c4, c3, PA, PB, PC]
```



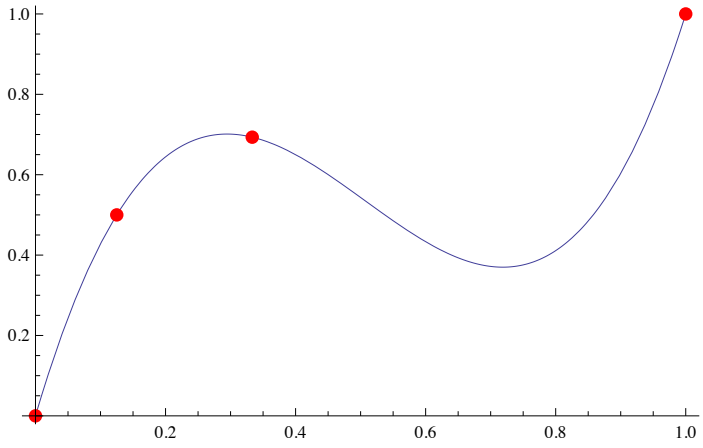

```
Lt[u] // Expand
```

$$\left\{-1-\frac{5\,u}{12}+\frac{7\,u^2}{12},\ 1-\frac{5\,u}{6}+\frac{u^2}{6}\right\}$$

```
(* interpolare Lagrange de grad 3 - forma explicita *)

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

y0 = 0;
y1 = ∛(1 / 8) ;
y2 = ∛(1 / 3) ;
y3 = 1;

L0[x_] := (x - x1) (x - x2) (x - x3) / ((x0 - x1) (x0 - x2) (x0 - x3));
L1[x_] := (x - x0) (x - x2) (x - x3) / ((x1 - x0) (x1 - x2) (x1 - x3));
L2[x_] := (x - x0) (x - x1) (x - x3) / ((x2 - x0) (x2 - x1) (x2 - x3));
L3[x_] := (x - x0) (x - x1) (x - x2) / ((x3 - x0) (x3 - x1) (x3 - x2));

L[x] // Simplify
```

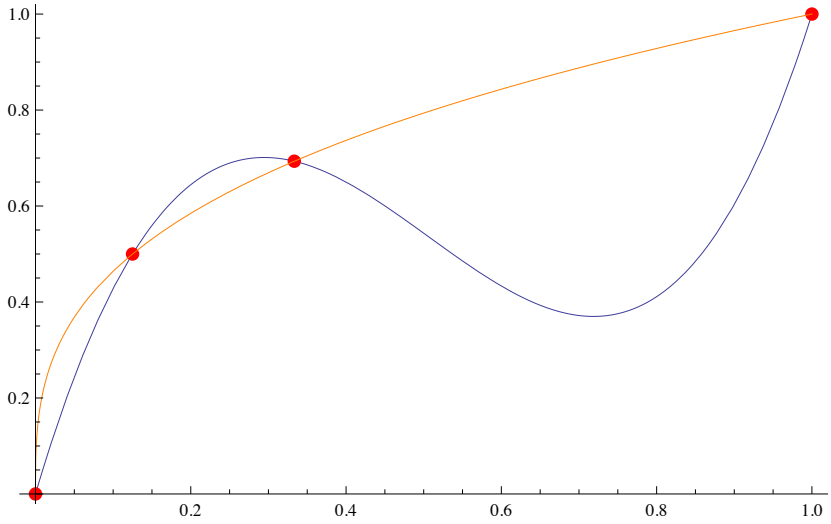
$$\frac{12}{35}\left(64\,(-1+x)\left(-\frac{1}{3}+x\right)-21\times 3^{2/3}\,(-1+x)\left(-\frac{1}{8}+x\right)+5\left(-\frac{1}{3}+x\right)\left(-\frac{1}{8}+x\right)\right)x$$

```
L[x_] := y0 L0[x] + y1 L1[x] + y2 L2[x] + y3 L3[x]

PA = Graphics[{Red, PointSize[Large], Point[{x0, y0}]}];
PB = Graphics[{Red, PointSize[Large], Point[{x1, y1}]}];
PC = Graphics[{Red, PointSize[Large], Point[{x2, y2}]}];
PD = Graphics[{Red, PointSize[Large], Point[{x3, y3}]}];

lagr1 = Plot[L[x], {x, x0, x3}];

Show[lagr1, PA, PB, PC, PD]
```

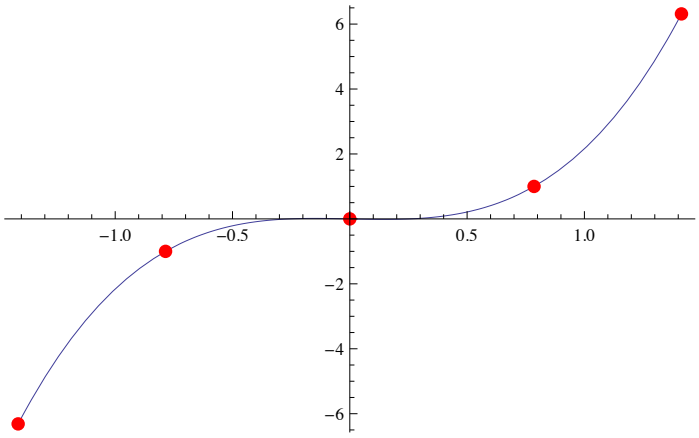



```
f[x_] := ∛x ;

grafic = Plot[f[x], {x, x0, x3}, PlotStyle → Orange];
```

```
Show[lagr1, PA, PB, PC, PD, grafic]
```



```
(* interpolare Lagrange de grad 4 - aproximarea functiei tangenta *)

x0 = -0.45 Pi;
x1 = -Pi / 4;
x2 = 0;
x3 = Pi / 4;
x4 = 0.45 Pi;

y0 = Tan[x0];
y1 = Tan[x1];
y2 = Tan[x2];
y3 = Tan[x3];
y4 = Tan[x4];

L0[x_] := (x - x1) (x - x2) (x - x3) (x - x4) / (x0 - x1) (x0 - x2) (x0 - x3) (x0 - x4);
L1[x_] := (x - x0) (x - x2) (x - x3) (x - x4) / (x1 - x0) (x1 - x2) (x1 - x3) (x1 - x4);
L2[x_] := (x - x0) (x - x1) (x - x3) (x - x4) / (x2 - x0) (x2 - x1) (x2 - x3) (x2 - x4);
L3[x_] := (x - x0) (x - x1) (x - x2) (x - x4) / (x3 - x0) (x3 - x1) (x3 - x2) (x3 - x4);
L4[x_] := (x - x0) (x - x1) (x - x2) (x - x3) / (x4 - x0) (x4 - x1) (x4 - x2) (x4 - x3);

L[x_] := y0 L0[x] + y1 L1[x] + y2 L2[x] + y3 L3[x] + y4 L4[x]

PA = Graphics[{Red, PointSize[Large], Point[{x0, y0}]}];
PB = Graphics[{Red, PointSize[Large], Point[{x1, y1}]}];
PC = Graphics[{Red, PointSize[Large], Point[{x2, y2}]}];
PD = Graphics[{Red, PointSize[Large], Point[{x3, y3}]}];
PE = Graphics[{Red, PointSize[Large], Point[{x4, y4}]}];

lagr1 = Plot[L[x], {x, x0, x4}];

Show[lagr1, PA, PB, PC, PD, PE]
```




```
f[x_] := Tan[x];

grafic = Plot[f[x], {x, x0, x4}, PlotStyle → Orange];
```

```
Show[lagr1, PA, PB, PC, PD, PE, grafic]
```