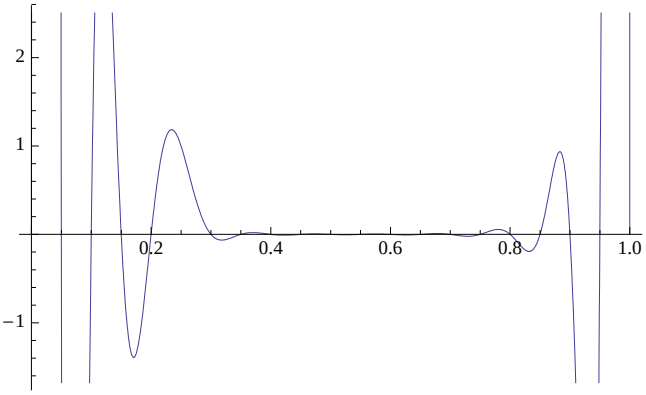
```
(** INTERPOLAZIONE **)

n = 20;
dx = 1.0 / n;
x[0] = 0;
x[n] = 1;
Do[x[i] = x[i - 1] + dx, {i, 1, n - 1}]
Do[Print["i = ", i, "  x[i] = ", x[i]], {i, 0, n}]
```

```
i = 0  x[i] = 0

i = 1  x[i] = 0.05

i = 2  x[i] = 0.1

i = 3  x[i] = 0.15

i = 4  x[i] = 0.2

i = 5  x[i] = 0.25

i = 6  x[i] = 0.3

i = 7  x[i] = 0.35

i = 8  x[i] = 0.4

i = 9  x[i] = 0.45

i = 10  x[i] = 0.5

i = 11  x[i] = 0.55

i = 12  x[i] = 0.6

i = 13  x[i] = 0.65

i = 14  x[i] = 0.7

i = 15  x[i] = 0.75

i = 16  x[i] = 0.8

i = 17  x[i] = 0.85

i = 18  x[i] = 0.9

i = 19  x[i] = 0.95

i = 20  x[i] = 1
```

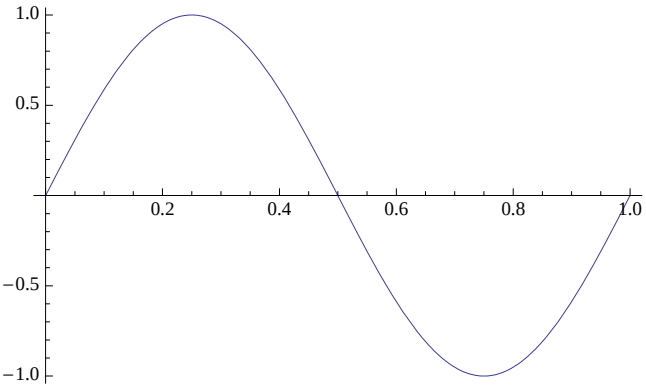
```
num[k_, xx_] := Product[xx - x[i], {i, 0, k - 1}] * Product[xx - x[i], {i, k + 1, n}]
den[k_, xx_] := Product[x[k] - x[i], {i, 0, k - 1}] * Product[x[k] - x[i], {i, k + 1, n}]
L[k_, xx_] := num[k, xx] / den[k, xx];
Print["L[k,xx] = ", L[k, xx]]
Plot[L[5, xx], {xx, 0, 1}]
```

$$L[k,xx] = \frac{\left(\prod_{i=0}^{-1+k} (xx - x[i])\right) \prod_{i=1+k}^{20} (xx - x[i])}{\left(\prod_{i=0}^{-1+k} (-x[i] + x[k])\right) \prod_{i=1+k}^{20} (-x[i] + x[k])}$$

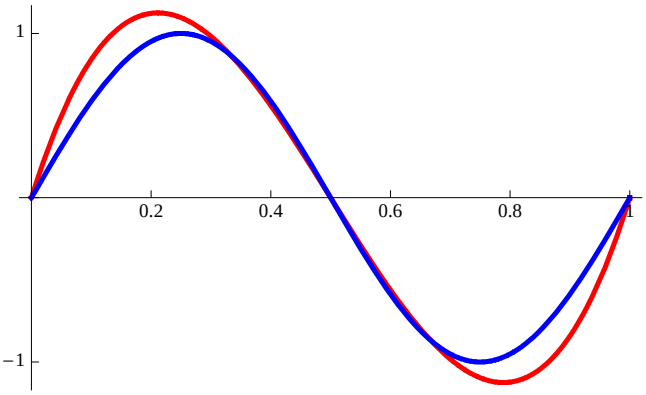



```
style1 = {RGBColor[1, 0, 0], Thickness[0.008]};
style2 = {RGBColor[0, 0, 1], Thickness[0.008]};
ticks1 = {{0, 0.2, 0.4, 0.6, 0.8, 1}, {-1, 0, 1}};
ticks2 = {{-1, -0.5, 0, 0.5, 1}, {-1, 0, 1}};
```

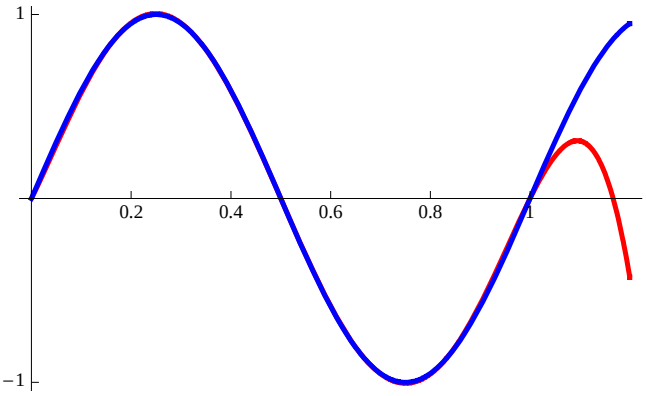
```
f[x_] := Sin[2 Pi * x]
Plot[f[x], {x, 0, 1}]
```



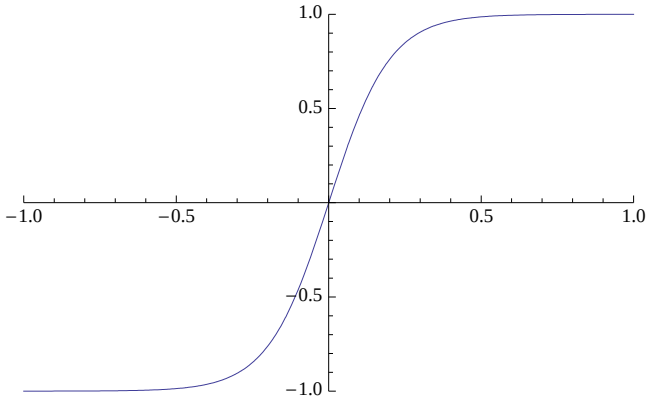
```
n = 3;
dx = 1.0 / n;
x[0] = 0;
y[0] = f[x[0]];
x[n] = 1;
y[n] = f[x[n]];
Do[x[i] = x[i - 1] + dx; y[i] = f[x[i]], {i, 1, n - 1}]
num[k_, xx_] := Product[xx - x[i], {i, 0, k - 1}] * Product[xx - x[i], {i, k + 1, n}]
den[k_, xx_] := Product[x[k] - x[i], {i, 0, k - 1}] * Product[x[k] - x[i], {i, k + 1, n}]
L[k_, xx_] := num[k, xx] / den[k, xx];
p[xx_] := Sum[y[k] * L[k, xx], {k, 0, n}]
Plot[{p[xx], f[xx]}, {xx, 0, 1}, PlotStyle → {style1, style2}, Ticks → ticks1]
```



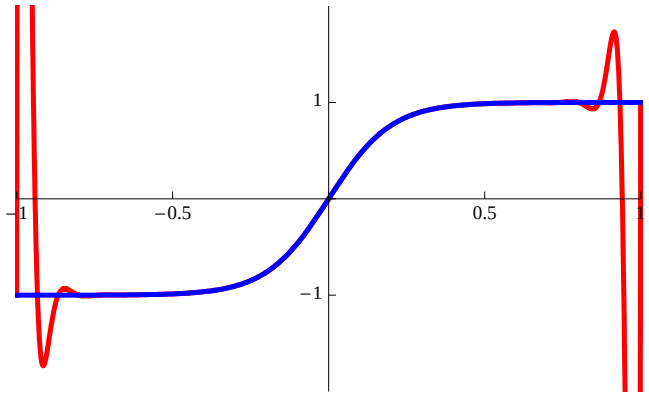

```
n = 6;
dx = 1.0 / n;
x[0] = 0;
y[0] = f[x[0]];
x[n] = 1;
y[n] = f[x[n]];
Do[x[i] = x[i - 1] + dx; y[i] = f[x[i]], {i, 1, n - 1}]
num[k_, xx_] := Product[xx - x[i], {i, 0, k - 1}] * Product[xx - x[i], {i, k + 1, n}]
den[k_, xx_] := Product[x[k] - x[i], {i, 0, k - 1}] * Product[x[k] - x[i], {i, k + 1, n}]
L[k_, xx_] := num[k, xx] / den[k, xx];
p[xx_] := Sum[y[k] * L[k, xx], {k, 0, n}]
Plot[{p[xx], f[xx]}, {xx, 0, 1.2}, PlotStyle → {style1, style2}, Ticks → ticks1]
```



```
Clear[f];
f[x_] := Tanh[5 x]
Plot[f[x], {x, -1, 1}, PlotRange → {{-1, 1}, {-1, 1}}]
```




```
n = 30;
dx = 2.0 / n;
x[0] = -1;
y[0] = f[x[0]];
x[n] = 1;
y[n] = f[x[n]];
Do[x[i] = x[i - 1] + dx; y[i] = f[x[i]], {i, 1, n - 1}]
num[k_, xx_] := Product[xx - x[i], {i, 0, k - 1}] * Product[xx - x[i], {i, k + 1, n}]
den[k_, xx_] := Product[x[k] - x[i], {i, 0, k - 1}] * Product[x[k] - x[i], {i, k + 1, n}]
L[k_, xx_] := num[k, xx] / den[k, xx];
p[xx_] := Sum[y[k] * L[k, xx], {k, 0, n}]
Plot[{p[xx], f[xx]}, {xx, -1, 1}, PlotStyle → {style1, style2},
 Ticks → ticks2, PlotRange → {{-1, 1}, {-2, 2}}]
```



```
g[x_] := Tanh[x]
Plot[g[x], {x, -1, 1}]
Plot[g''''''[x], {x, -1, 1}]
```