```
restart;
#f := x -> abs( sin(20·Pi·x) );
f := x -> sqrt(x);
#f := x -> e^(1/(x+0.4)^2);
#f := x -> sin(50·x);
```

$$f := x \mapsto \sqrt{x} \tag{1}$$

```
with(geometry) :; with(LinearAlgebra) :;

xs := [ seq( i/10, i=0..10 ) ];
# расширенный узловой вектор
XS := [ -0.2, -0.1, seq(xs[i], i=1..11), 1.1, 1.2];
YS := map(f, XS);
```

$$xs := \left[0, \frac{1}{10}, \frac{1}{5}, \frac{3}{10}, \frac{2}{5}, \frac{1}{2}, \frac{3}{5}, \frac{7}{10}, \frac{4}{5}, \frac{9}{10}, 1\right]$$

$$XS := \left[-0.2, -0.1, 0, \frac{1}{10}, \frac{1}{5}, \frac{3}{10}, \frac{2}{5}, \frac{1}{2}, \frac{3}{5}, \frac{7}{10}, \frac{4}{5}, \frac{9}{10}, 1, 1.1, 1.2\right]$$

$$YS := \left[0.4472135955\,I, 0.3162277660\,I, 0, \frac{\sqrt{10}}{10}, \frac{\sqrt{5}}{5}, \frac{\sqrt{30}}{10}, \frac{\sqrt{10}}{5}, \frac{\sqrt{2}}{2}, \frac{\sqrt{15}}{5}, \frac{\sqrt{70}}{10}, \frac{2\sqrt{5}}{5}, \frac{3\sqrt{10}}{10}, 1, 1.048808848, 1.095445115\right] \tag{2}$$

```
n := 10;
```

$$n := 10 \tag{3}$$

```
# B spline функция 0го порядка
N0 := (i,t) ->
 if t >= XS[i] and t < XS[i+1]
   then 1;
   else 0;
 end if;
```

$$N0 := (i,t) \mapsto \textbf{if } XS_i \le t < XS_{i+1} \textbf{ then } 1 \textbf{ else } 0 \textbf{ end if} \tag{4}$$

```
# B spline функция любого порядка (ф-ла Кокса, Де Бура)
 N := proc(i, n, t)
   local tl;
   if n=0 then N0(i,t);
   else
     tl := 0;
```

```
    if XS[i+n]-XS[i] <> 0 then tl := (t-XS[i])*N(i,n-1,t)/(n*0.1) end if;
    if XS[i+n+1]-XS[i+1] <> 0 then tl := tl
     + (XS[i+n+1]-t)*N(i+1,n-1,t)/(n*0.1) end if;
    return tl;
 end if;
end proc:
```

 # функция для квадратичного B сплайна

```
B := (i,t) -> N(i,2,t);
```

$$B := (i,t) \mapsto N(i,2,t) \tag{5}$$

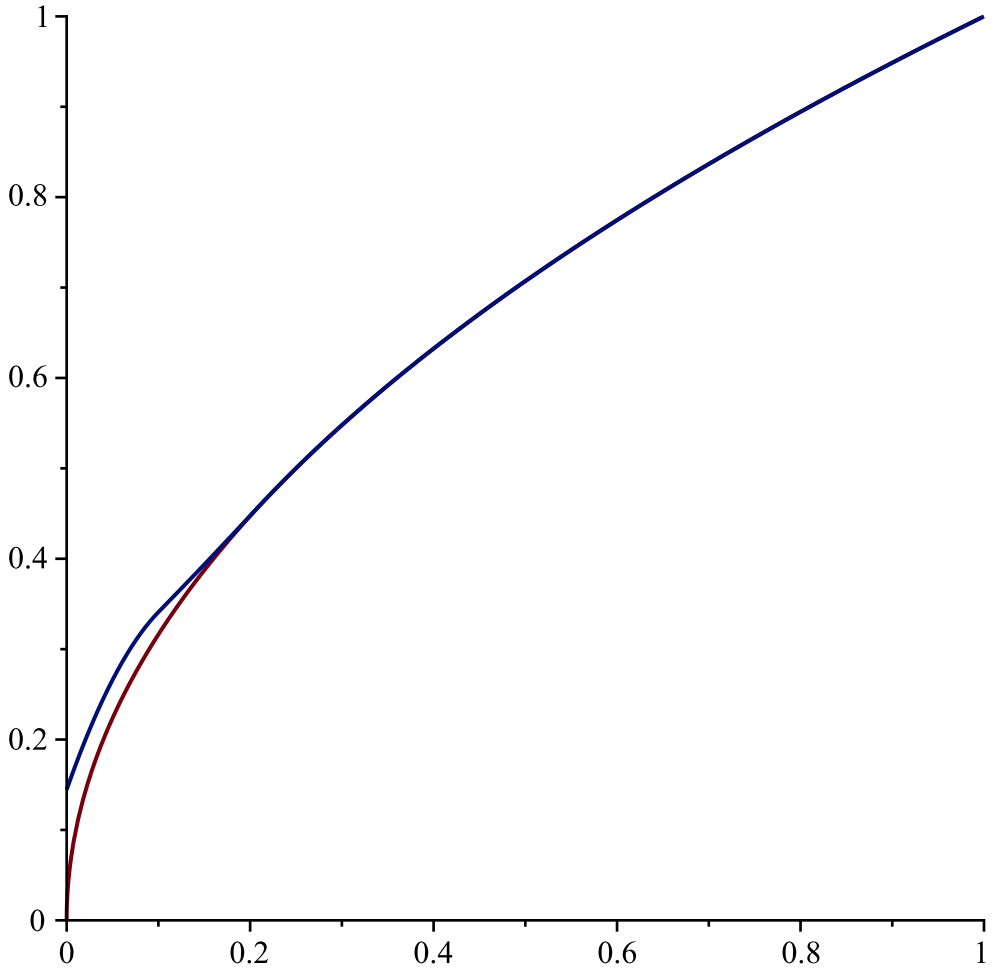
```
#c := i -> f((XS[i+1]+XS[i+2])/2);

c := i -> if i=1 then f(XS[1]) elif 1 < i < n+3 then 1/2*(-f(XS[i+1]) + 4
    *f((XS[i+1]+XS[i+2])/2) - f(XS[i+2])) else f(XS[n+2]) end if;
```

$$c := i \mapsto \text{if } i = 1 \text{ then } f(XS_1) \text{ elif } 1 < i < n+3 \text{ then } -\frac{f(XS_{i+1})}{2} + 2 \cdot f\left(\frac{XS_{i+1}}{2} + \frac{XS_{i+2}}{2}\right) - \frac{f(XS_{i+2})}{2} \text{ else } f(XS_{n+2}) \text{ end if} \tag{6}$$

```
S := x ->
    if x < 0.2 then
      add(c(i+1)*B(i+1,x), i=1..n);
    else
      add(c(i+2)*B(i+2,x), i=1..n);
    end if:;
```

```
Warning, (in S) `i` is implicitly declared local
plot([f,S], 0..1);
```



$$XXS := \left[seq\left(\frac{i}{100}, i = 1 \,..100 \right) \right] :;$$

$$errorm := (f, approx) \rightarrow evalf\left(\max\left(map\left(x \rightarrow (\mathrm{abs}(f(x) - approx(x))), XXS\right)\right)\right);$$

$$errorm(S, f);$$

$$errorm := (f, approx) \mapsto evalf\left(\max\left(map\left(x \mapsto |f(x) - approx(x)|, XXS\right)\right)\right)$$

$$0.0725332102 \qquad \textbf{(7)}$$