

Feb 2, 2012

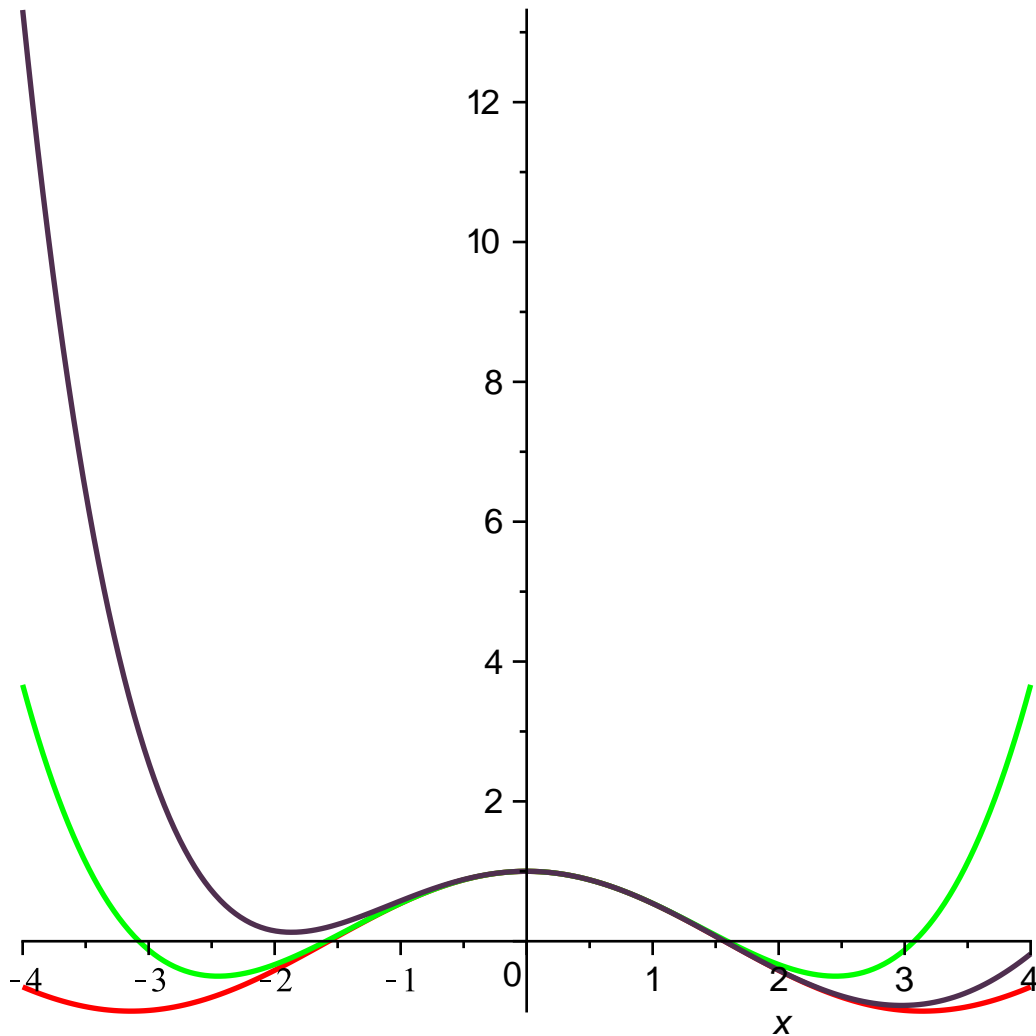
```
> p1:=taylor(cos(x),x,6);
```

$$p1 := 1 - \frac{1}{2} x^2 + \frac{1}{24} x^4 + O(x^6) \quad (1)$$

```
> p2:=taylor(cos(x),x=Pi/4,6);
```

$$p2 := \frac{1}{2} \sqrt{2} - \frac{1}{2} \sqrt{2} \left(x - \frac{1}{4} \pi\right) - \frac{1}{4} \sqrt{2} \left(x - \frac{1}{4} \pi\right)^2 + \frac{1}{12} \sqrt{2} \left(x - \frac{1}{4} \pi\right)^3 \\ + \frac{1}{48} \sqrt{2} \left(x - \frac{1}{4} \pi\right)^4 - \frac{1}{240} \sqrt{2} \left(x - \frac{1}{4} \pi\right)^5 + O\left(\left(x - \frac{1}{4} \pi\right)^6\right) \quad (2)$$

```
> plot([cos(x),convert(p1,polynomial), convert(p2,polynomial)],x=-4..4,  
color=[red,green,violet], thickness=2);
```



Back to what we were doing.

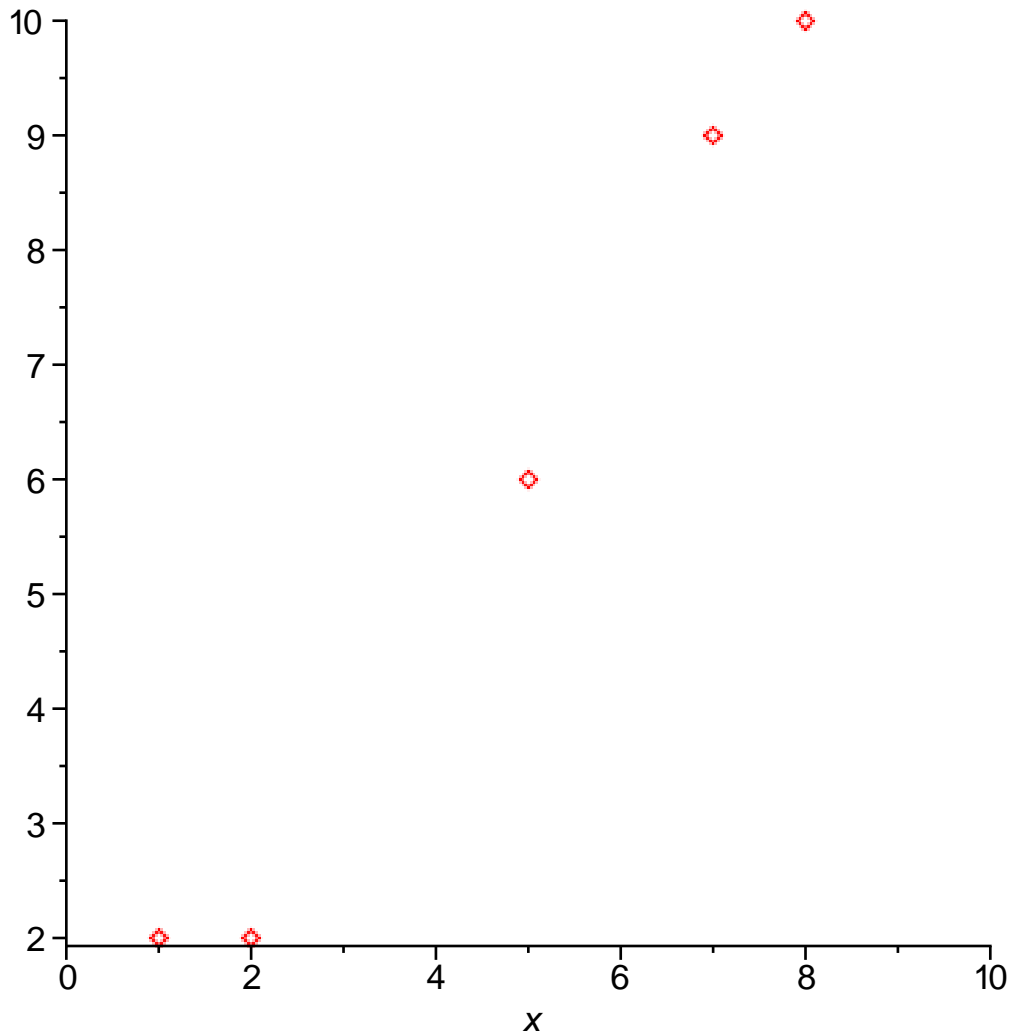
```
> data:=[[1,2], [2,2], [5,6], [7,9], [8,10]];
```

(3)

(3)

```
data := [[1, 2], [2, 2], [5, 6], [7, 9], [8, 10]]
```

```
> plot(data,x=0..10,style=point,symbolsize=15);
```



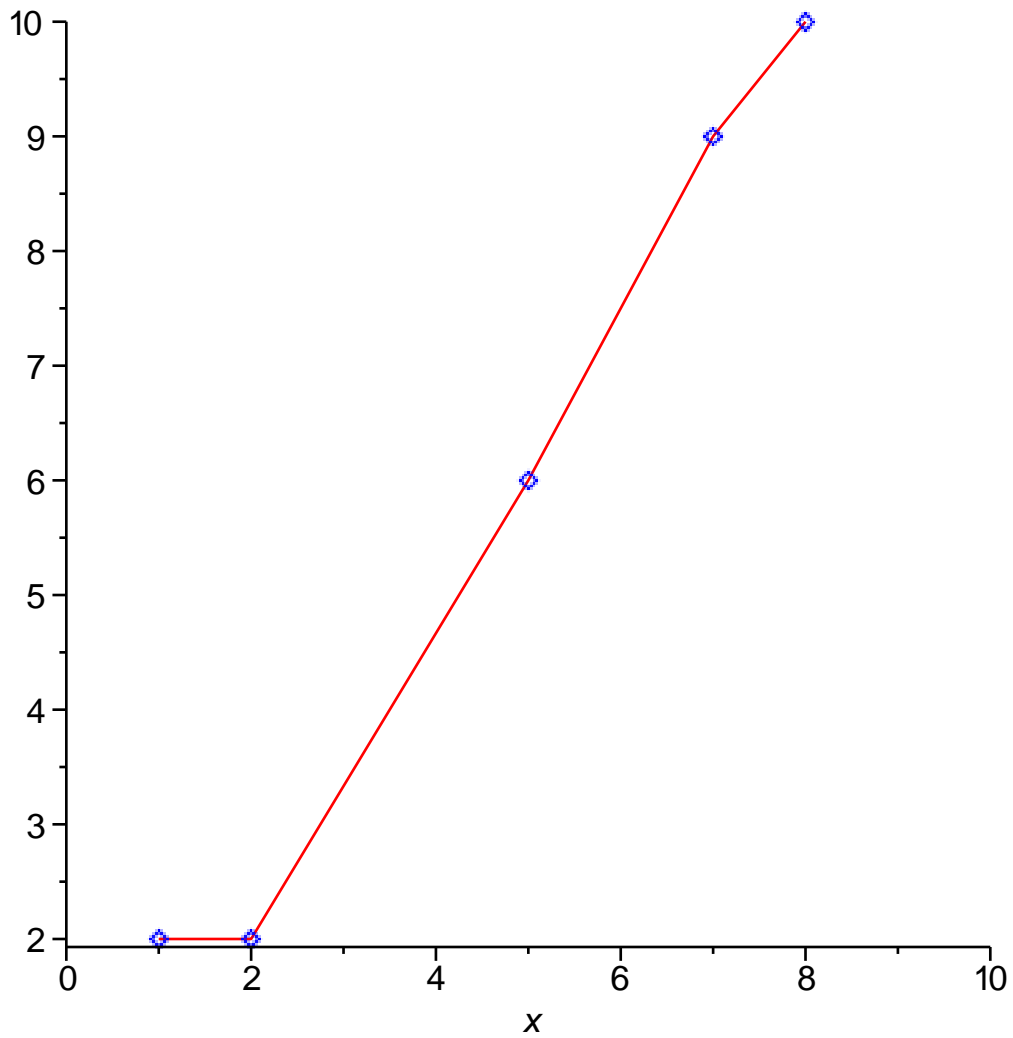
```
> with(CurveFitting): with(plots):
```

```
> Spline(data,x);
```

$$\left\{ \begin{array}{ll} 2 + \frac{206}{591}x - \frac{103}{197}x^2 + \frac{103}{591}x^3 & x < 2 \\ \frac{6938}{1773} - \frac{1490}{591}x + \frac{539}{591}x^2 - \frac{115}{1773}x^3 & x < 5 \\ -\frac{1069}{1576} + \frac{1105}{4728}x + \frac{569}{1576}x^2 - \frac{133}{4728}x^3 & x < 7 \\ -\frac{7208}{197} + \frac{36935}{2364}x - \frac{362}{197}x^2 + \frac{181}{2364}x^3 & \text{otherwise} \end{array} \right.$$

(4)

```
> display(plot(data,x=0..10,style=line,symbolsize=15,color=red),  
plot(data,x=0..10,style=point,symbolsize=15,color=blue));
```



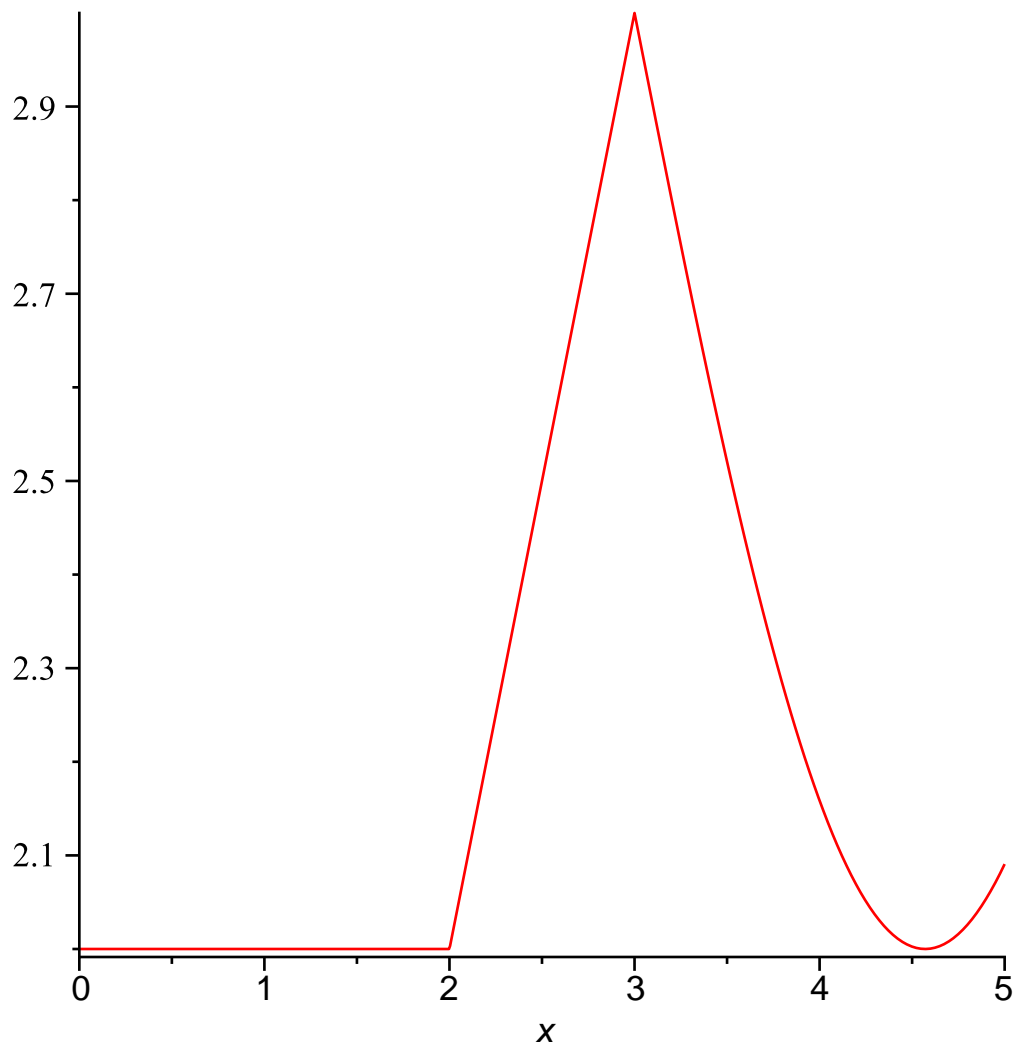
```
> ?piecewise
```

```
> f:=piecewise(x<2,2, x<3, x, 3-sin(x-3));
```

$$f := \begin{cases} 2 & x < 2 \\ x & x < 3 \\ 3 - \sin(x - 3) & \text{otherwise} \end{cases}$$

```
> plot(f,x=0..5);
```

(5)

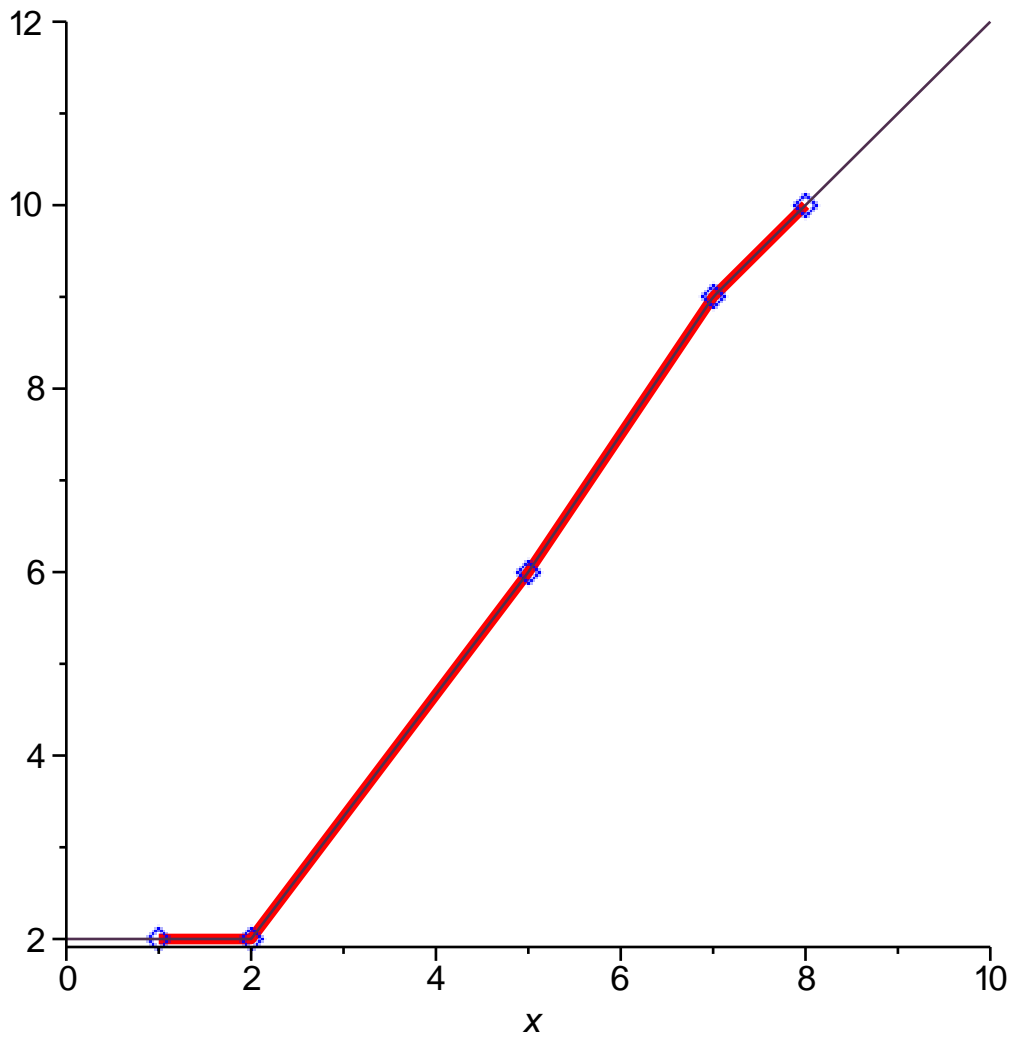


```
> s1:=Spline(data,x,degree=1);
```

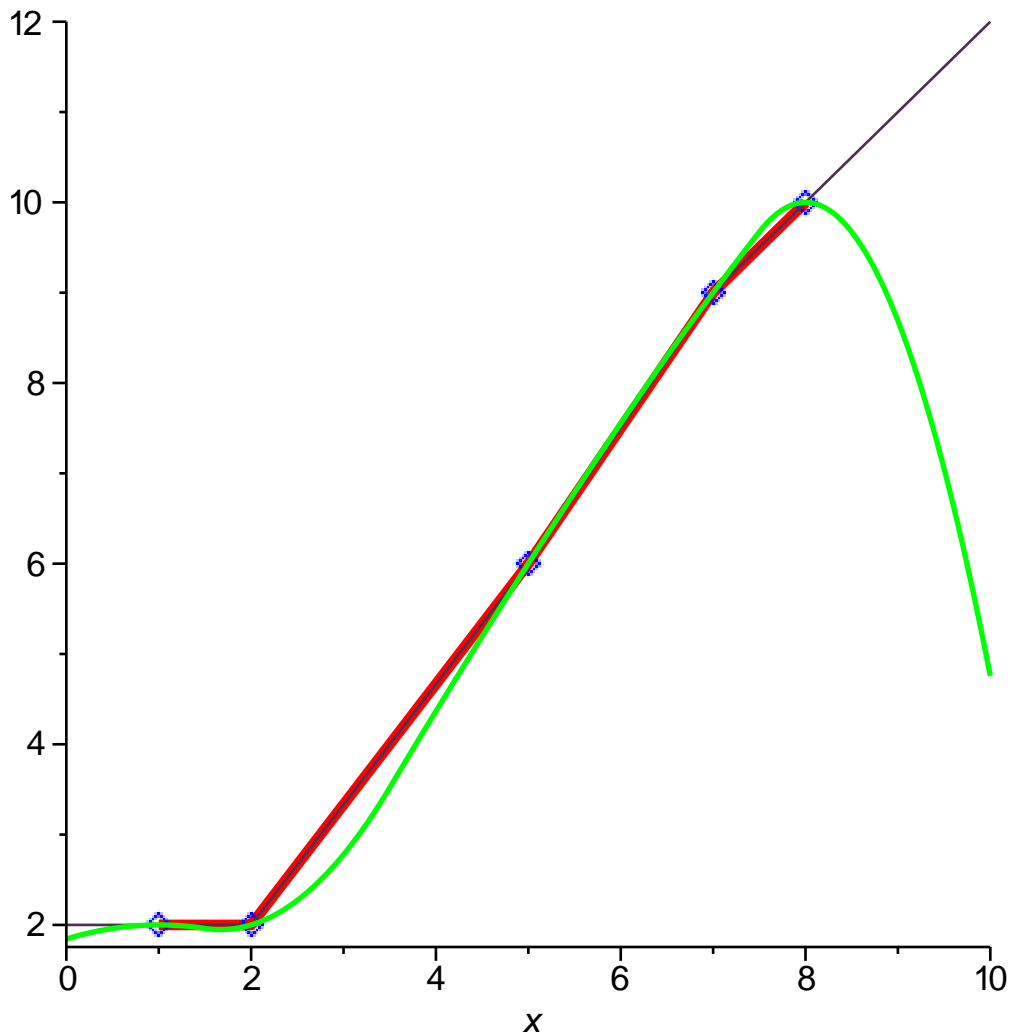
$$s1 := \begin{cases} 2 & x < 2 \\ -\frac{2}{3} + \frac{4}{3}x & x < 5 \\ -\frac{3}{2} + \frac{3}{2}x & x < 7 \\ x + 2 & \text{otherwise} \end{cases}$$

(6)

```
> display(plot(data,x=0..10,style=line,symbolsize=15,color=red,
thickness=4),
plot(data,x=0..10,style=point,symbolsize=18,color=blue),
plot(s1,x=0..10,color=violet)) ;
```



```
> display(plot(data,x=0..10,style=line,symbolsize=15,color=red,
thickness=4),
plot(data,x=0..10,style=point,symbolsize=18,color=blue),
plot(s1,x=0..10,color=violet),
plot(Spline(data,x,degree=2),x=0..10,color=green,thickness=2));
```



**> Spline(data,x,degree=2);**

$$\left\{ \begin{array}{ll} \frac{1444}{783} + \frac{244}{783}x - \frac{122}{783}x^2 & x < \frac{3}{2} \\ \frac{2542}{783} - \frac{1220}{783}x + \frac{122}{261}x^2 & x < \frac{7}{2} \\ -\frac{6976}{2349} + \frac{4684}{2349}x - \frac{94}{2349}x^2 & x < 6 \\ -\frac{9316}{2349} + \frac{5464}{2349}x - \frac{53}{783}x^2 & x < \frac{15}{2} \\ -\frac{173566}{2349} + \frac{49264}{2349}x - \frac{3079}{2349}x^2 & \text{otherwise} \end{array} \right.$$

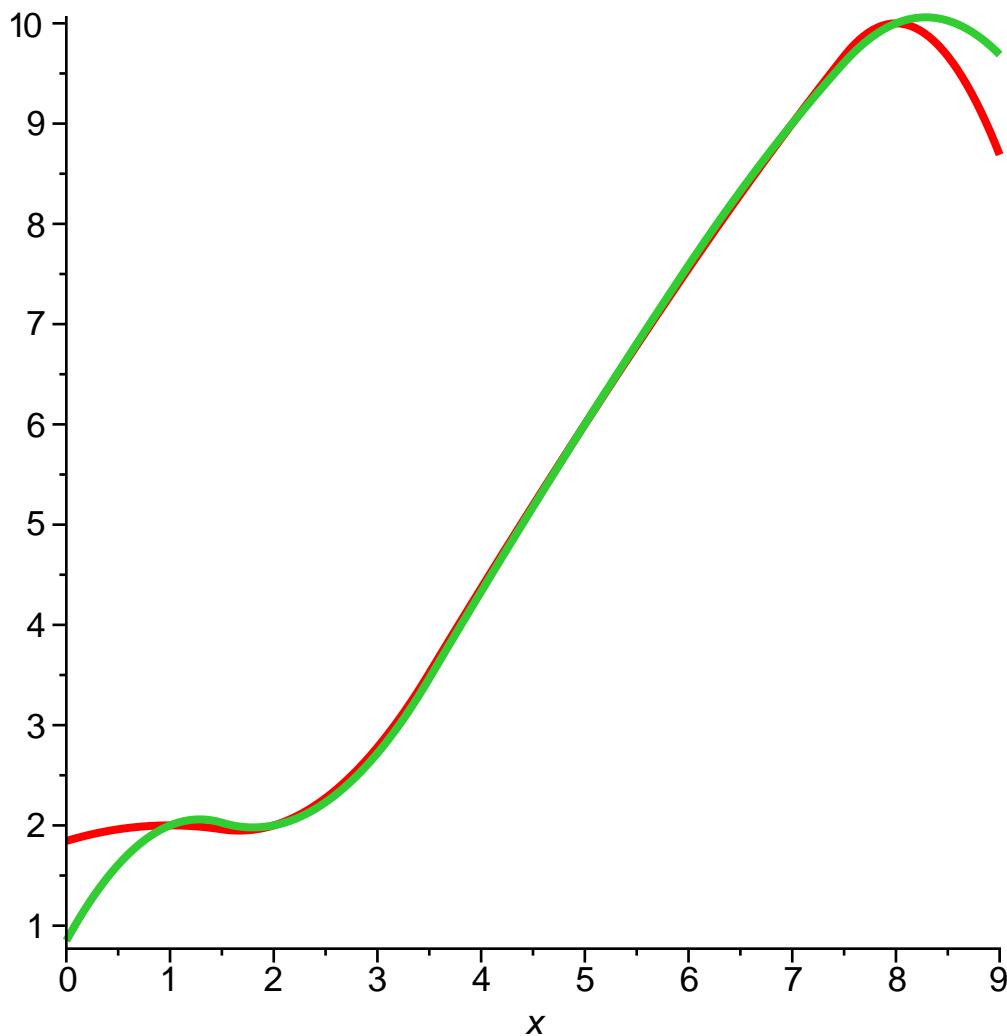
(7)

**> Spline(data,x,degree=2,endpoints=periodic);**

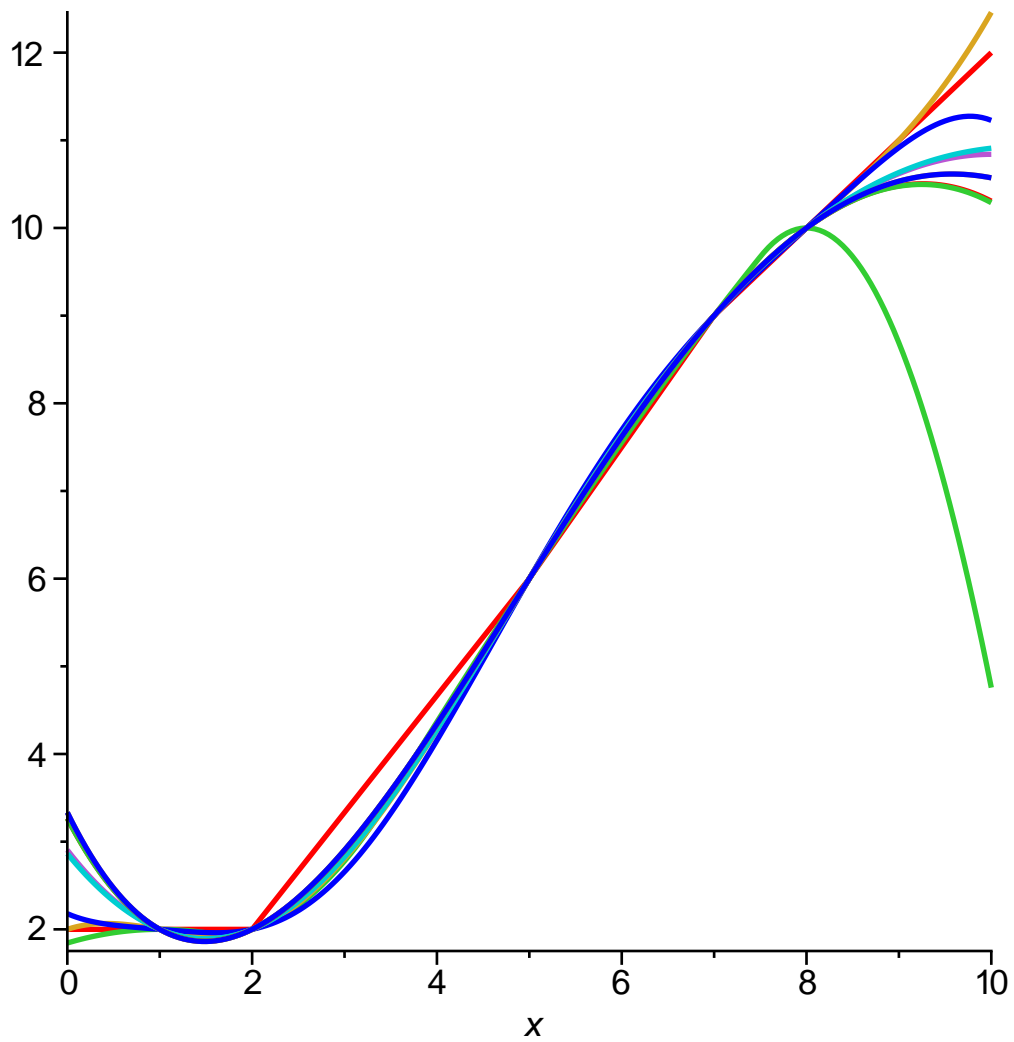
$$\left\{ \begin{array}{ll} \frac{1835}{2158} + \frac{12173}{6474}x - \frac{2365}{3237}x^2 & x < \frac{3}{2} \\ \frac{3943}{1079} - \frac{12031}{6474}x + \frac{1669}{3237}x^2 & x < \frac{7}{2} \\ -\frac{20491}{6474} + \frac{53}{26}x - \frac{133}{3237}x^2 & x < 6 \\ -\frac{41659}{6474} + \frac{6751}{2158}x - \frac{427}{3237}x^2 & x < \frac{15}{2} \\ -\frac{129842}{3237} + \frac{26131}{2158}x - \frac{2365}{3237}x^2 & \text{otherwise} \end{array} \right.$$

(8)

```
> plot({Spline(data,x,degree=2), Spline(data,x,degree=2,Endpoints=
periodic)}, x=0..9,thickness=3);
```

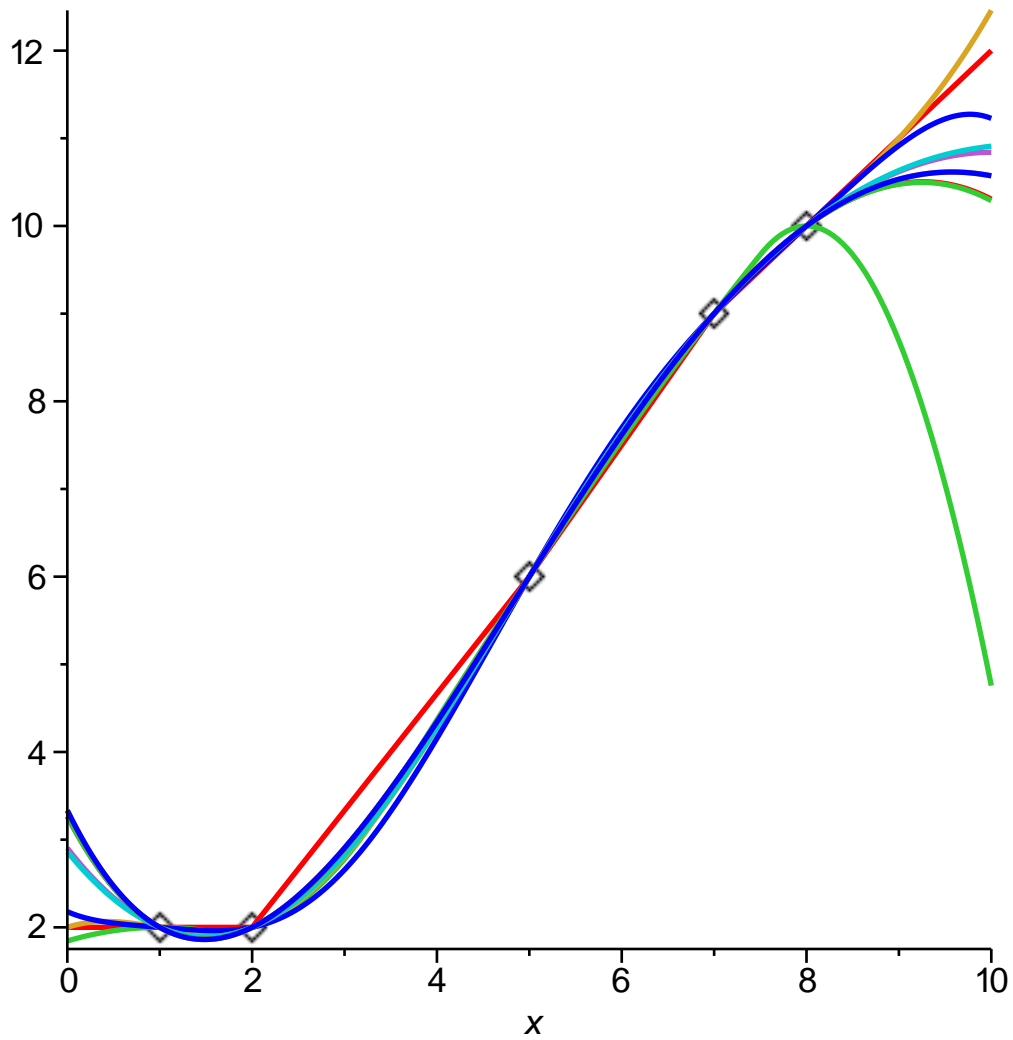


```
> plot([seq(Spline(data,x,degree=i),i=1..10)],x=0..10,thickness=2);
```



```
> display( {plot(data,x=0..10,style=point,symbolsize=20,color=black),plot([seq(Spline(data,x,degree=i),i=1..10)],x=0..10,thickness=2) } );
```





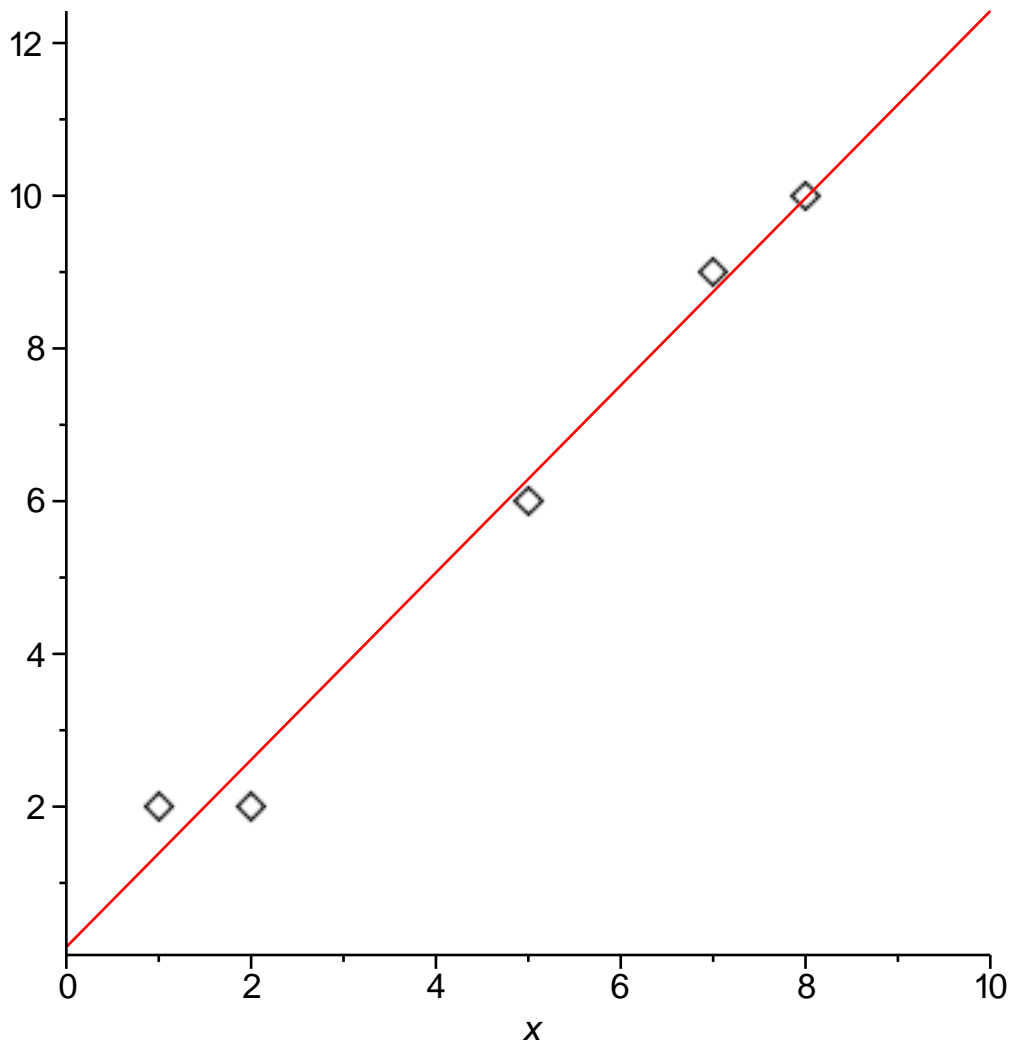
```
> LeastSquares(data,x);
```

$$\frac{5}{31} + \frac{38}{31} x$$

(9)

```
> PtPlot := plot(data,x=0..10,style=point,symbolsize=20,color=black);
```

```
> display( PtPlot, plot(LeastSquares(data,x),x=0..10));
```



```
> pt := [1, 4];
```

```
pt := [1, 4] (10)
```

```
> pt[1];
```

```
1 (11)
```

```
> pt[2];
```

```
4 (12)
```

```
> d1 := ( m, b, pt ) -> m*pt[1]+ b - pt[2];
```

```
d1 := (m, b, pt) -> m*pt1 + b - pt2 (13)
```

```
> d1(3, 2, [1, 4]);
```

```
1 (14)
```

```
> d1(1, 3, [1, 4]);
```

```
0 (15)
```

```
> d1(1, 3, [1, 20]);
```

```
-16 (16)
```

```
> d1 := ( m, b, pt ) -> abs(m*pt[1]+ b - pt[2]);
```

```
d1 := (m, b, pt) -> |m*pt1 + b - pt2| (17)
```

```
> d1(1, 3, [1, 20]);
```

```
16 (18)
```

