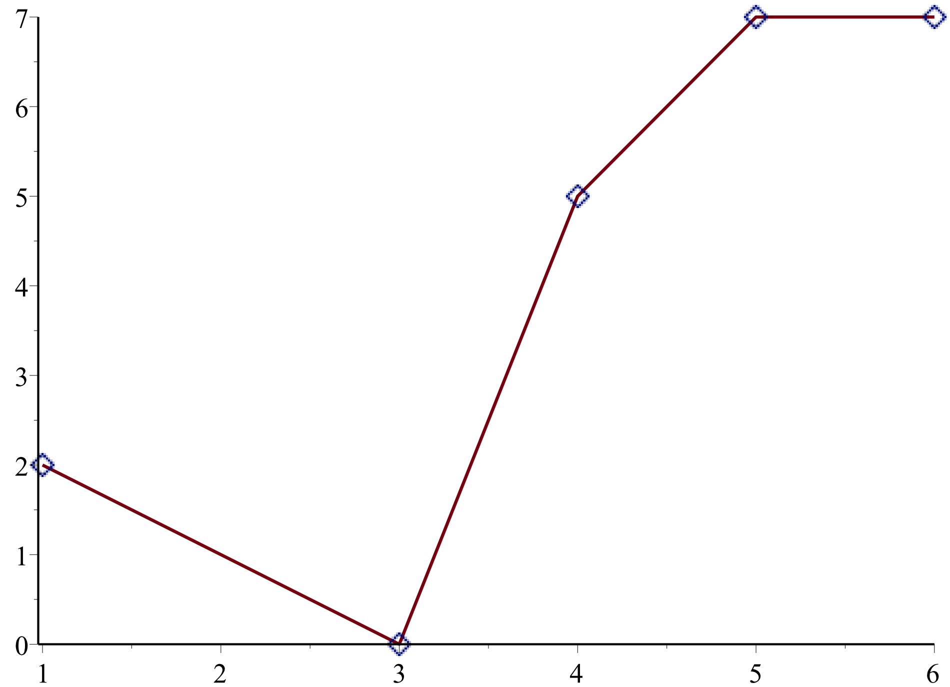
>

> $data := [[1, 2], [3, 0], [4, 5], [5, 7], [6, 7]];$

$$data := [[1, 2], [3, 0], [4, 5], [5, 7], [6, 7]] \quad (1)$$

> $plot([data, data], style = [line, point], symbolsize = 20);$



want to solve for coefficents

> "this is a comment" :

> $f := x \rightarrow a \cdot x^4 + b \cdot x^3 + c \cdot x^2 + d \cdot x + e;$

$$f := x \rightarrow a\,x^4 + b\,x^3 + c\,x^2 + d\,x + e \quad (2)$$

> $applyf := p \rightarrow f(p[1]) = p[2];$

$$applyf := p \rightarrow f(p_1) = p_2 \quad (3)$$

> $applyf(data[3]);$

$$256\,a + 64\,b + 16\,c + 4\,d + e = 5 \quad (4)$$

want to evaluate *applyf* at each element of *data*, solve the resulting set of equations.

> $seq(applyf(data[i]), i = 1..5);$

$$a + b + c + d + e = 2, 81\,a + 27\,b + 9\,c + 3\,d + e = 0, 256\,a + 64\,b + 16\,c + 4\,d + e = 5, 625\,a + 125\,b + 25\,c + 5\,d + e = 7, 1296\,a + 216\,b + 36\,c + 6\,d + e = 7 \quad (5)$$

this doesn't make sense

> $f([2, 1]);$

$$a\,[2, 1]^4 + b\,[2, 1]^3 + c\,[2, 1]^2 + d\,[2, 1] + e \quad (6)$$

> $f(2);$

(7)

$$16\,a+8\,b+4\,c+2\,d+e \quad (7)$$

> applyf(rabbit)

$$a\,rabbit_1^4+b\,rabbit_1^3+c\,rabbit_1^2+d\,rabbit_1+e=rabbit_2 \quad (8)$$

> $seq\left(\cos\left(\frac{Pi\cdot x}{2}\right), x=0..5\right);$

$$1, 0, -1, 0, 1, 0 \quad (9)$$

> [seq(applyf(data[i]), i=1..5)];

$$[a+b+c+d+e=2, 81\,a+27\,b+9\,c+3\,d+e=0, 256\,a+64\,b+16\,c+4\,d+e=5, 625\,a+125\,b+25\,c+5\,d+e=7, 1296\,a+216\,b+36\,c+6\,d+e=7] \quad (10)$$

> solve(%);

$$\left\{a=\frac{5}{24}, b=-\frac{43}{12}, c=\frac{511}{24}, d=-\frac{575}{12}, e=32\right\} \quad (11)$$

> solve(a+b+c+d+e=2, 81 a+27 b+9 c+3 d+e=0);

Error, invalid input: too many and/or wrong type of arguments passed to solve; first unused argument is 81*a+27*b+9*c+3*d+e = 0

> solve({a+b+c+d+e=2, 81 a+27 b+9 c+3 d+e=0});

$$\{a=a, b=b, c=c, d=-40\,a-13\,b-4\,c-1, e=39\,a+12\,b+3\,c+3\} \quad (12)$$

> solve({a+b+c+d+e=2, 81 a+27 b+9 c+3 d+e=0}, {a, b});

$$\left\{a=\frac{13}{27}\,e-1+\frac{1}{3}\,c+\frac{4}{9}\,d, b=-\frac{40}{27}\,e+3-\frac{4}{3}\,c-\frac{13}{9}\,d\right\} \quad (13)$$

>

>

> data := [[1, 2], [3, -2], [4, 5], [5, 7], [6, 7]];

$$data := [[1, 2], [3, -2], [4, 5], [5, 7], [6, 7]] \quad (14)$$

> solve([seq(applyf(data[i]), i=1..5)]);

$$\left\{a=\frac{3}{8}, b=-\frac{25}{4}, c=\frac{289}{8}, d=-\frac{321}{4}, e=52\right\} \quad (15)$$

> $map\left(\cos, \left[0, \frac{Pi}{4}, \frac{Pi}{2}, \frac{27\cdot Pi}{6}\right]\right);$

$$\left[1, \frac{1}{2}\sqrt{2}, 0, 0\right]p \quad (16)$$

> $\cos\left(\left[0, \frac{Pi}{4}, \frac{Pi}{2}, \frac{27\cdot Pi}{6}\right]\right);$

Error, invalid input: cos expects its 1st argument, x, to be of type algebraic, but received [0, (1/4)*Pi, (1/2)*Pi, (9/2)*Pi]

> solve(map(applyf, data));

$$\left\{a=\frac{3}{8}, b=-\frac{25}{4}, c=\frac{289}{8}, d=-\frac{321}{4}, e=52\right\} \quad (17)$$

> CurveFitting[PolynomialInterpolation](data, x);

$$\frac{3}{8}\,x^4-\frac{25}{4}\,x^3+\frac{289}{8}\,x^2-\frac{321}{4}\,x+52 \quad (18)$$

> ?CurveFitting

> PolynomialInterpolation(data, x);

$$PolynomialInterpolation([[1, 2], [3, -2], [4, 5], [5, 7], [6, 7]], x) \quad (19)$$

> *with*(*CurveFitting*);

[*ArrayInterpolation*, *BSpline*, *BSplineCurve*, *Interactive*, *LeastSquares*, *PolynomialInterpolation*, *RationalInterpolation*, *Spline*, *ThieleInterpolation*] **(20)**

> *PolynomialInterpolation*(*data*, *x*);

$$\frac{3}{8}x^4 - \frac{25}{4}x^3 + \frac{289}{8}x^2 - \frac{321}{4}x + 52 \qquad \textbf{(21)}$$

> *data*;

[[1, 2], [3, -2], [4, 5], [5, 7], [6, 7]] **(22)**

> *nops*(*data*);

5 **(23)**

> *op*(*data*);

[1, 2], [3, -2], [4, 5], [5, 7], [6, 7] **(24)**

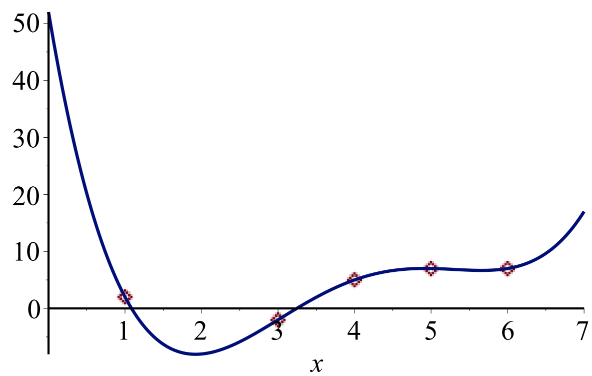
> *nops*(*f*);

1 **(25)**

> *op*(*f*);

$$x \rightarrow a\,x^4 + b\,x^3 + c\,x^2 + d\,x + e \qquad \textbf{(26)}$$

> *plot*([*data*, *PolynomialInterpolation*(*data*, *x*)], *x* = 0 ..7, *style* = [*point*, *line*], *symbolsize* = 25);



> *data*[5]; *data*[1 ..4];

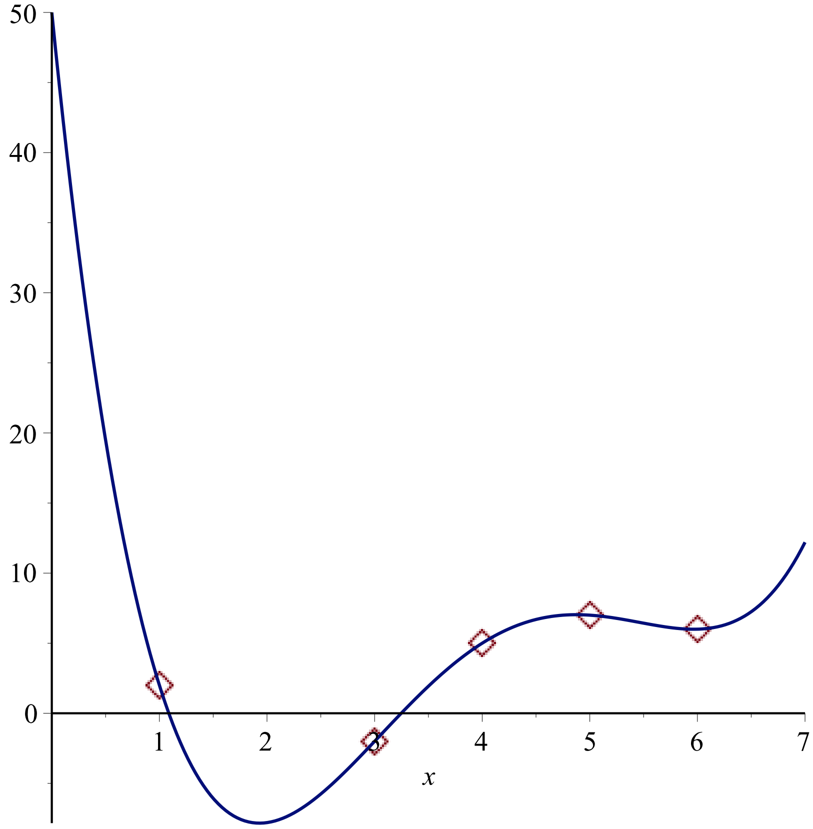
[6, 7]

[[1, 2], [3, -2], [4, 5], [5, 7]] **(27)**

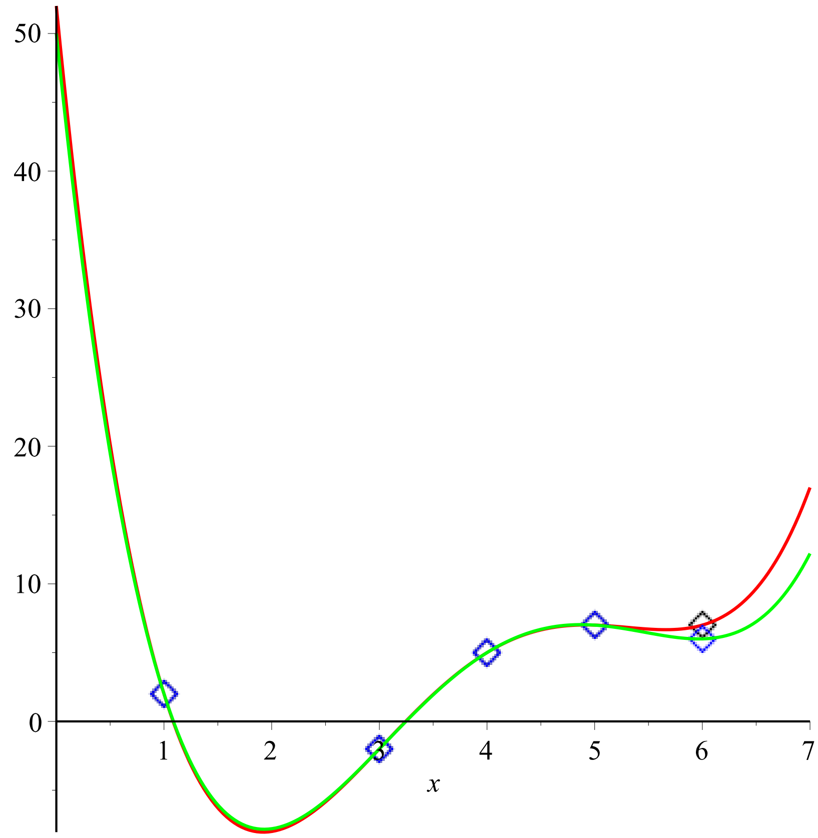
> *newdata* := [*op*(*data*[1 ..4]), [6, 6]];

newdata := [[1, 2], [3, -2], [4, 5], [5, 7], [6, 6]] **(28)**

> *plot*([*newdata*, *PolynomialInterpolation*(*newdata*, *x*)], *x* = 0 ..7, *style* = [*point*, *line*], *symbolsize* = 25);



> $plot([data, PolynomialInterpolation(data, x), newdata, PolynomialInterpolation(newdata, x)], x = 0..7, style = [point, line, point, line], color = [black, red, blue, green], symbolsize = 25);$



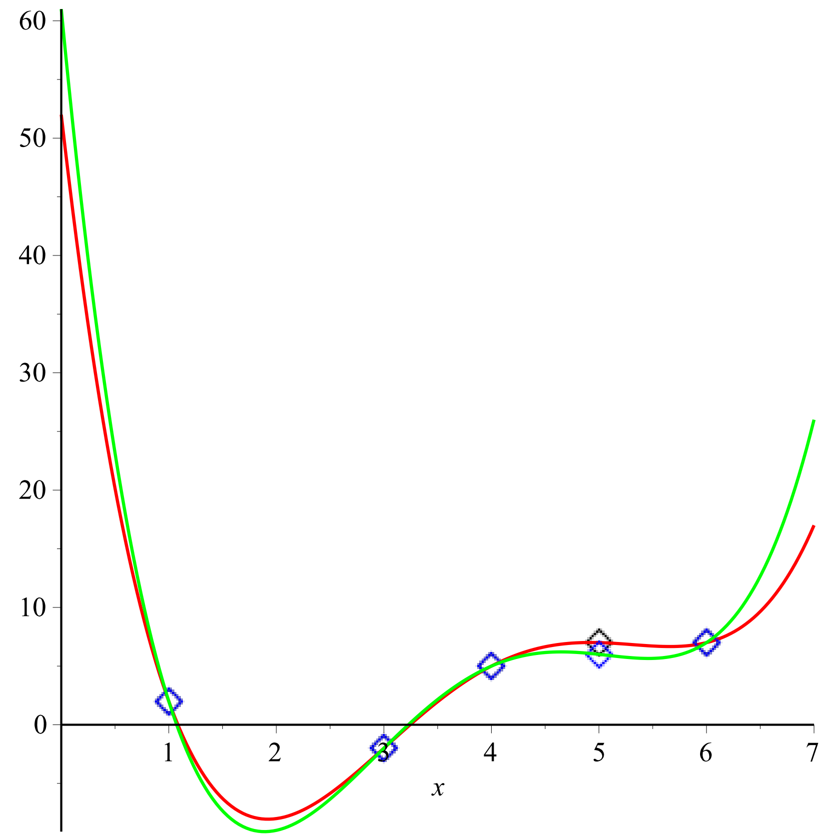
> *data*[4];

$[5, 7]$ **(29)**

> *gnudata* := [*op*(*data*[1 ..3]), [5, 6], *data*[5]];

$gnudata := [[1, 2], [3, -2], [4, 5], [5, 6], [6, 7]]$ **(30)**

> *plot*([*data*, *PolynomialInterpolation*(*data*, *x*), *gnudata*, *PolynomialInterpolation*(*gnudata*, *x*)], *x* = 0 ..7, *style* = [*point*, *line*, *point*, *line*], *color* = [*black*, *red*, *blue*, *green*], *symbolsize* = 25);



>

>

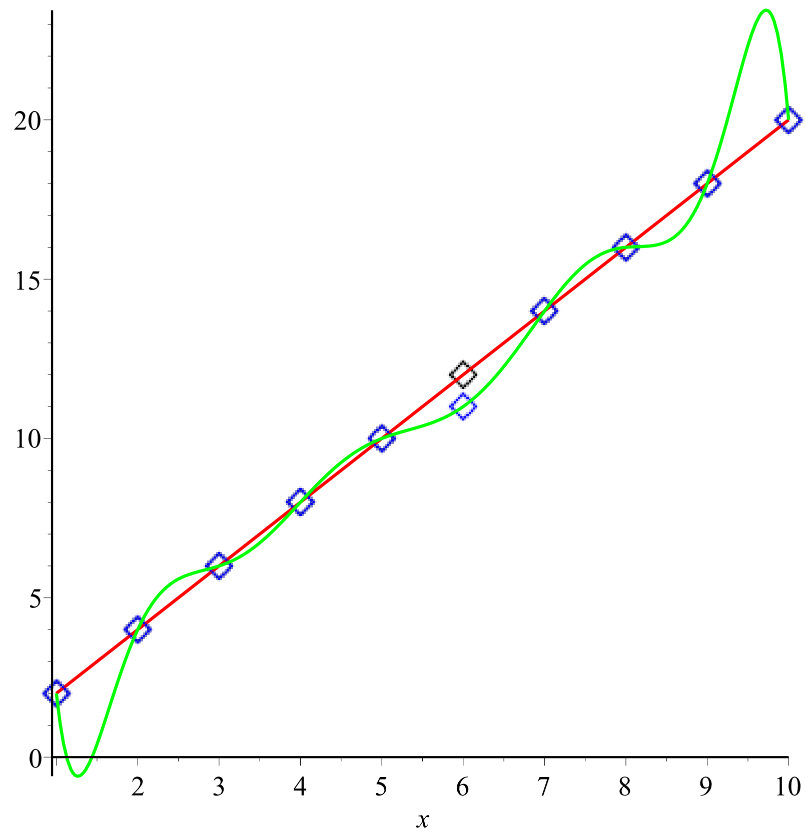
> $data := [seq([i, 2\cdot i], i = 1..10)];$

$data := [[1, 2], [2, 4], [3, 6], [4, 8], [5, 10], [6, 12], [7, 14], [8, 16], [9, 18], [10, 20]]$ **(31)**

> $newdata := [op(data[1..5]), [6, 11], op(data[7..10])];$

$newdata := [[1, 2], [2, 4], [3, 6], [4, 8], [5, 10], [6, 11], [7, 14], [8, 16], [9, 18], [10, 20]]$ **(32)**

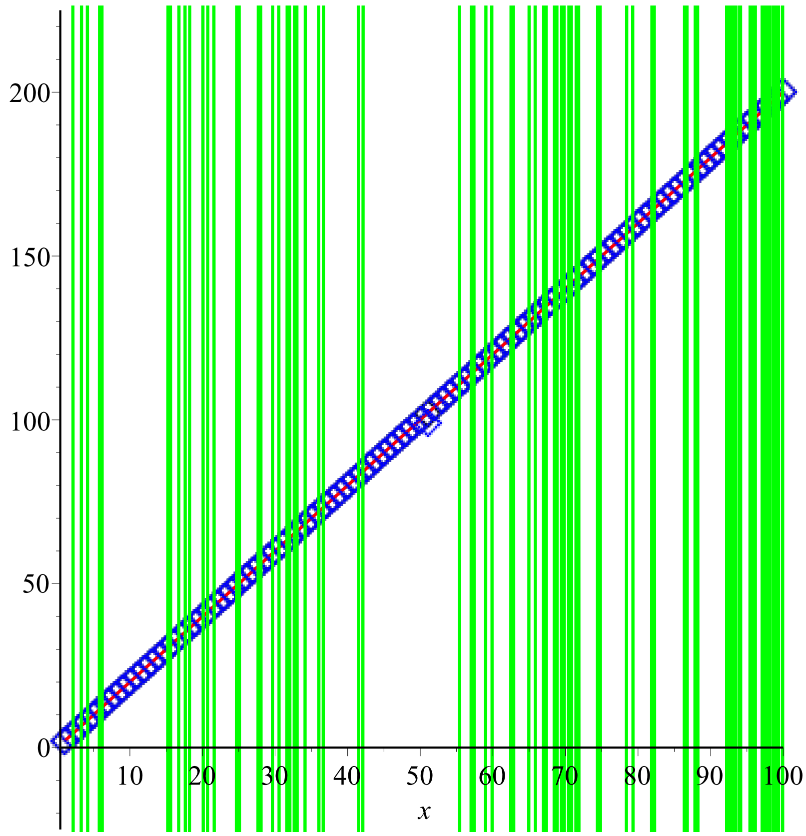
> $plot([data, PolynomialInterpolation(data, x), newdata, PolynomialInterpolation(newdata, x)], x = 1..10, style = [point, line, point, line], color = [black, red, \text{blue}, \text{green}], symbolsize = 25);$



> $data := [seq([i, 2 \cdot i], i = 1..100)]:$

> $newdata := [op(data[1..50]), [51, 99], op(data[52..100])]:$

> $plot([data, PolynomialInterpolation(data, x), newdata, PolynomialInterpolation(newdata, x)], x = 1..100, style = [point, line, point, line], color = [black, red, \text{blue}, \text{green}], symbolsize = 25);$



> $g := unapply(PolynomialInterpolation(newdata, x), x)$:

> $g(3);$

$$6 \quad (33)$$

> $g(66);$

$$132 \quad (34)$$

> $g(3.1);$

$$5.091\ 10^{24} \quad (35)$$

> $data := [seq([i, 2 \cdot i], i = 1 ..5)];$

$$data := [[1, 2], [2, 4], [3, 6], [4, 8], [5, 10]] \quad (36)$$

> $PolynomialInterpolation(data, x)$

$$2\,x \quad (37)$$

> $h := x \rightarrow PolynomialInterpolation(data, x)$

$$h := x \rightarrow CurveFitting\text{:-}PolynomialInterpolation(data, x) \quad (38)$$

>

> $g := unapply(PolynomialInterpolation(data, x), x);$

$$g := x \rightarrow 2\,x \quad (39)$$

> $data := [seq([i, 3 \cdot i], i = 1 ..5)];$

$$data := [[1, 3], [2, 6], [3, 9], [4, 12], [5, 15]] \quad (40)$$

> $h(x);$

$$3\,x \tag{41}$$

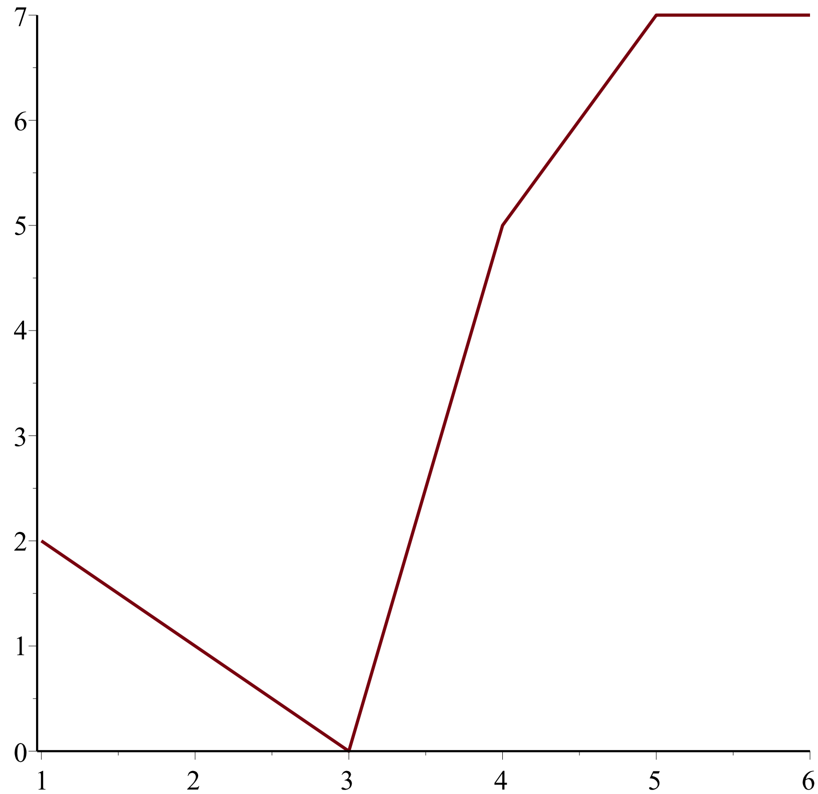
> $g(x);$

$$2\,x \tag{42}$$

> $data := [[1, 2], [3, 0], [4, 5], [5, 7], [6, 7]];$

$$data := [[1, 2], [3, 0], [4, 5], [5, 7], [6, 7]] \tag{43}$$

> $plot(data);$



> $?spline$

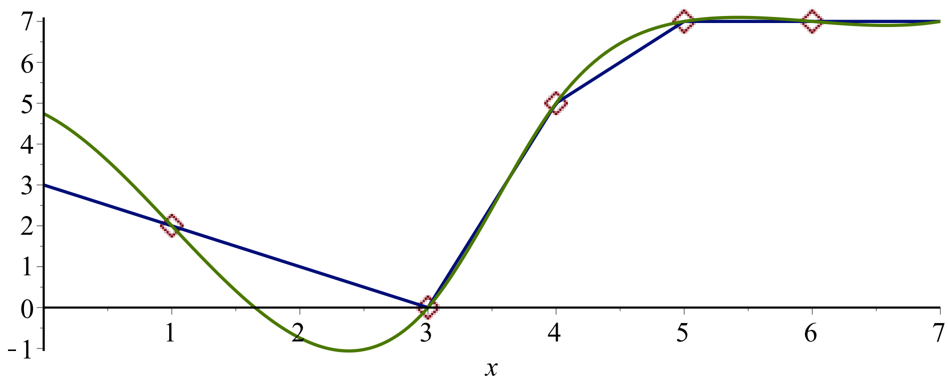
> $Spline(data, x, degree = 1);$

$$\begin{cases} 3 - x & x < 3 \\ -15 + 5\,x & x < 4 \\ -3 + 2\,x & x < 5 \\ 7 & otherwise \end{cases} \tag{44}$$

> $Spline(data, x, \mathrm{degree} = 3);$

$$\begin{cases} \frac{25}{43}x^3 - \frac{75}{43}x^2 - \frac{68}{43}x + \frac{204}{43} & x < 3 \\ -\frac{92}{43}x^3 + \frac{978}{43}x^2 - \frac{3227}{43}x + \frac{3363}{43} & x < 4 \\ \frac{31}{43}x^3 - \frac{498}{43}x^2 + \frac{2677}{43}x - \frac{4509}{43} & x < 5 \\ \frac{11}{43}x^3 - \frac{198}{43}x^2 + \frac{1177}{43}x - \frac{2009}{43} & \text{otherwise} \end{cases} \tag{45}$$

```
> plot([data, Spline(data, x, degree = 1), Spline(data, x, degree = 3)], x = 0 ..7, style = [point, line,
    line], symbolsize = 25);
```




```
>
>
```