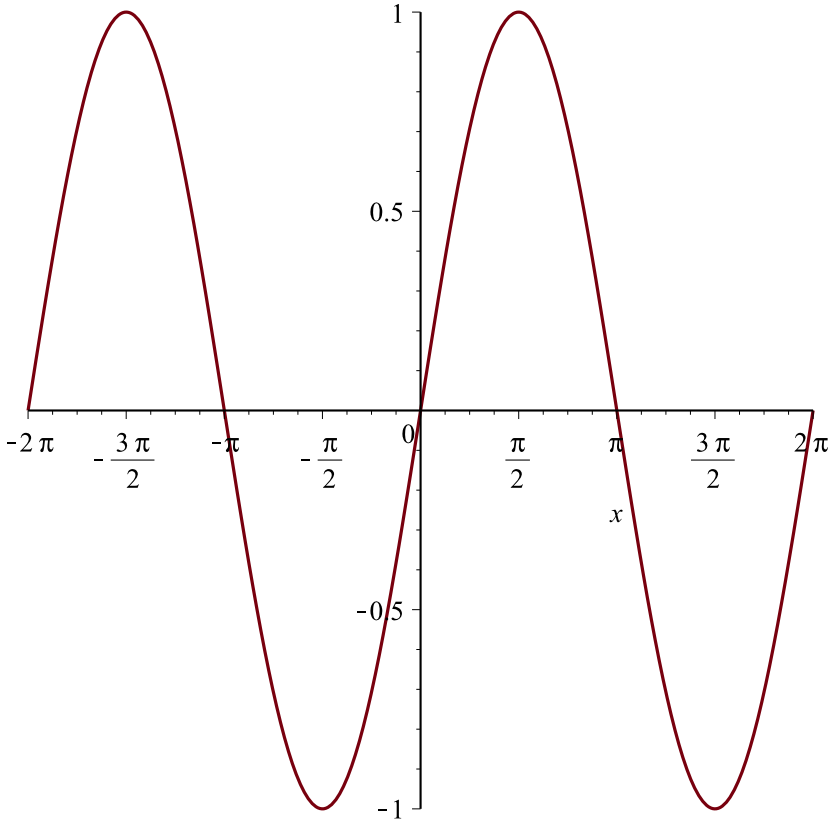
> $\sin(x)$

$$\sin(x) \quad \textbf{(1)}$$

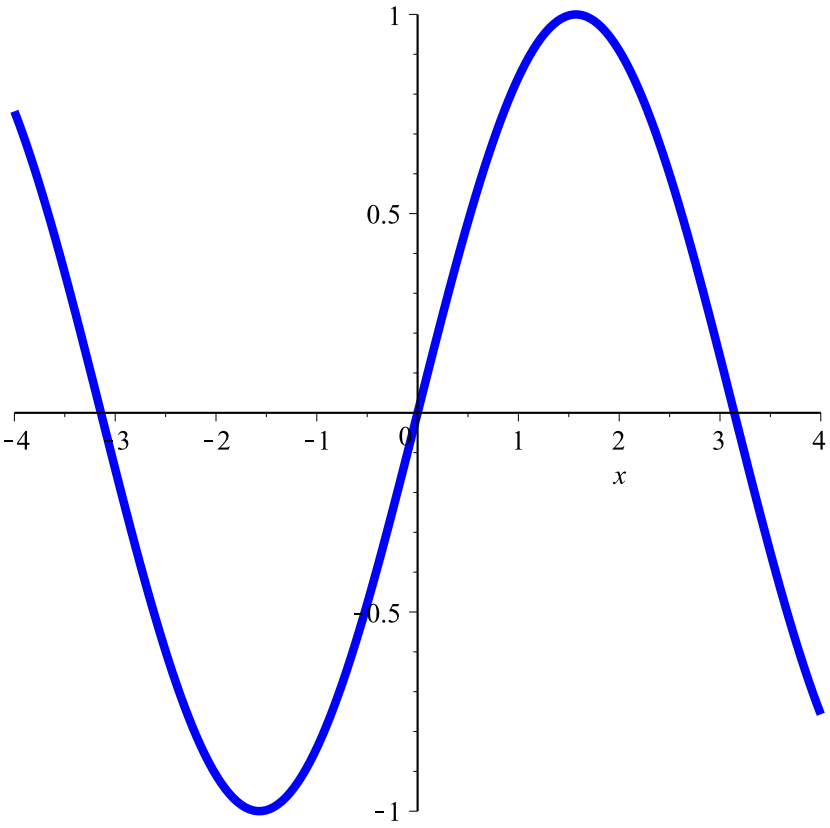
can right click on sin(x), select **Plots > 2D-Plot** to get a plot.

> *smartplot*(**(1)**)

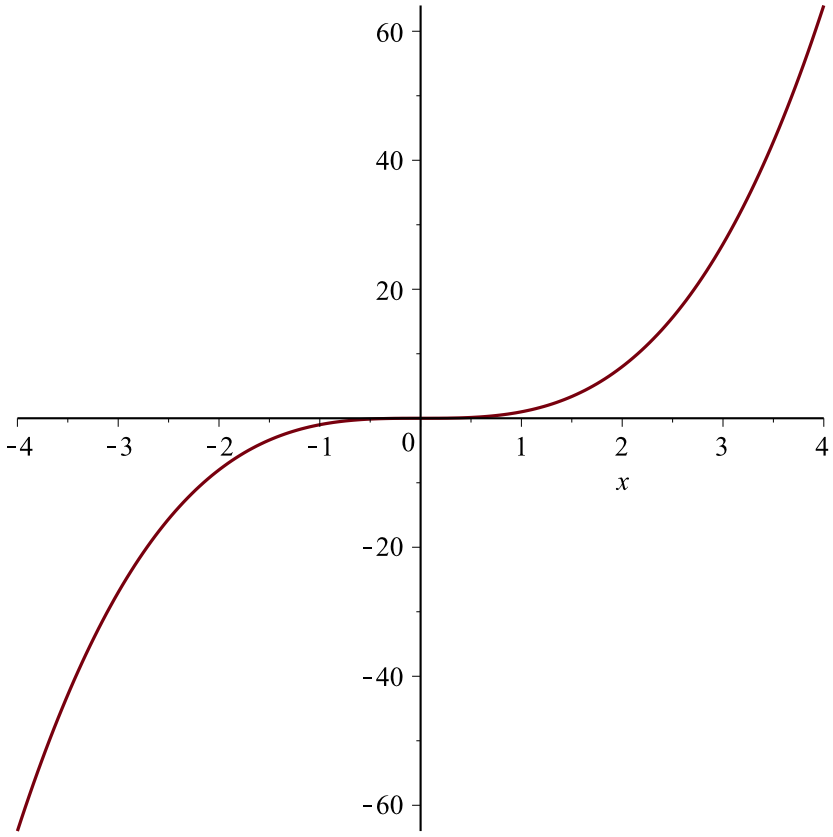


You can manipulate the above graph with the buttons and stuff, but it might be easier to get exactly what you want by just telling maple via the plot command.

> *plot*($\sin(x)$, $x = -4..4$, *color* = *blue*, *thickness* = 4)

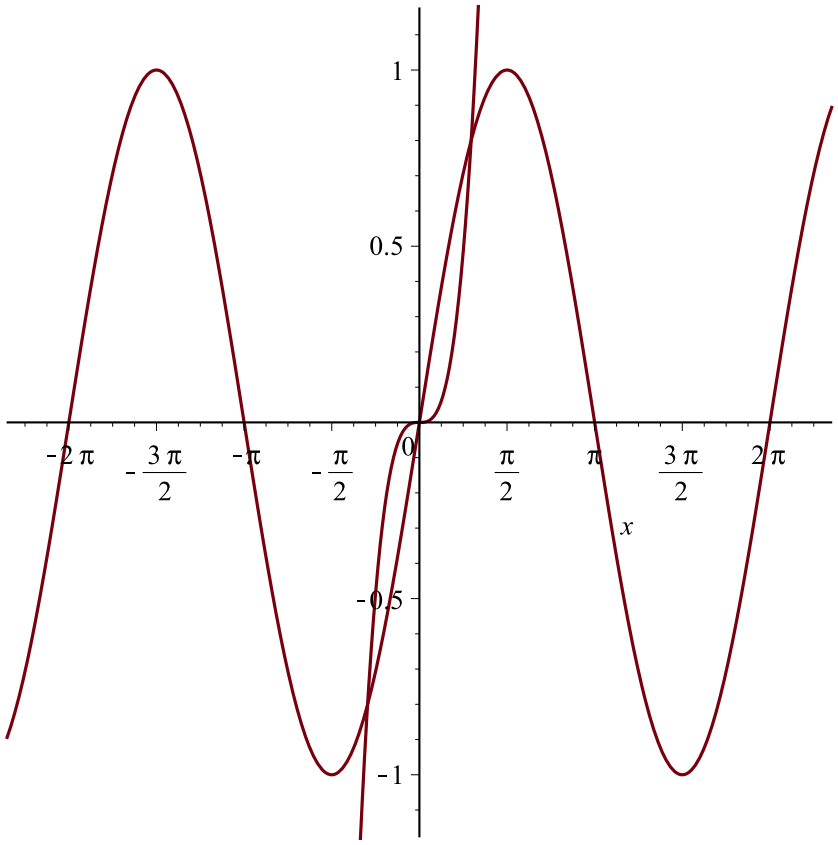


> $plot(x^3, x=-4..4);$



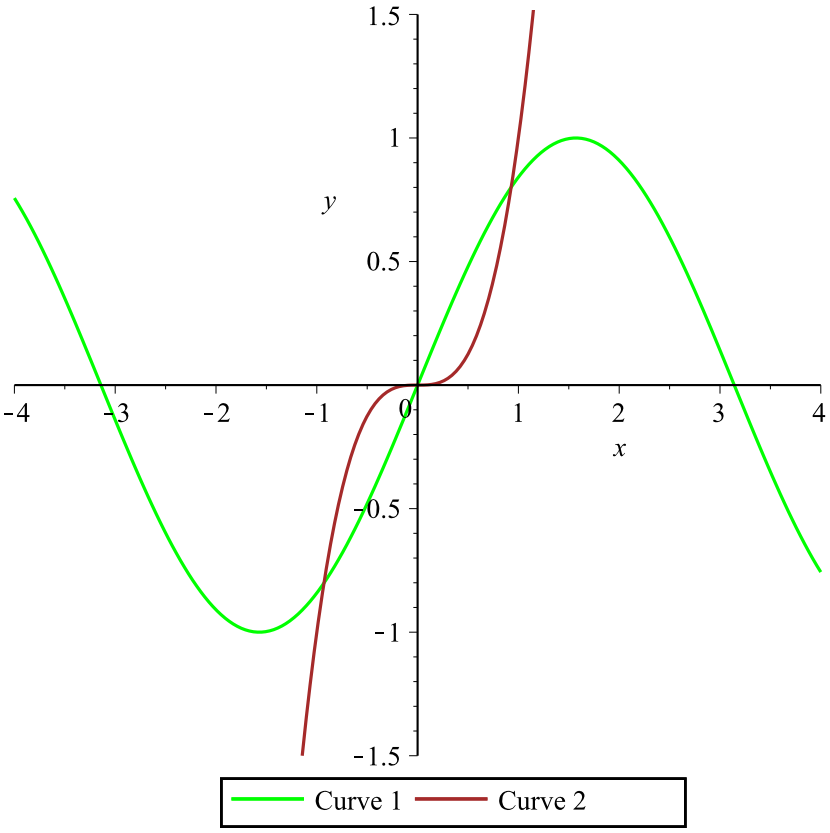
If I want these two on the same axes, I can drag (or copy/paste) one graph onto the other. But the result may not be exactly what I want.

> *smartplot*(**(1)**)



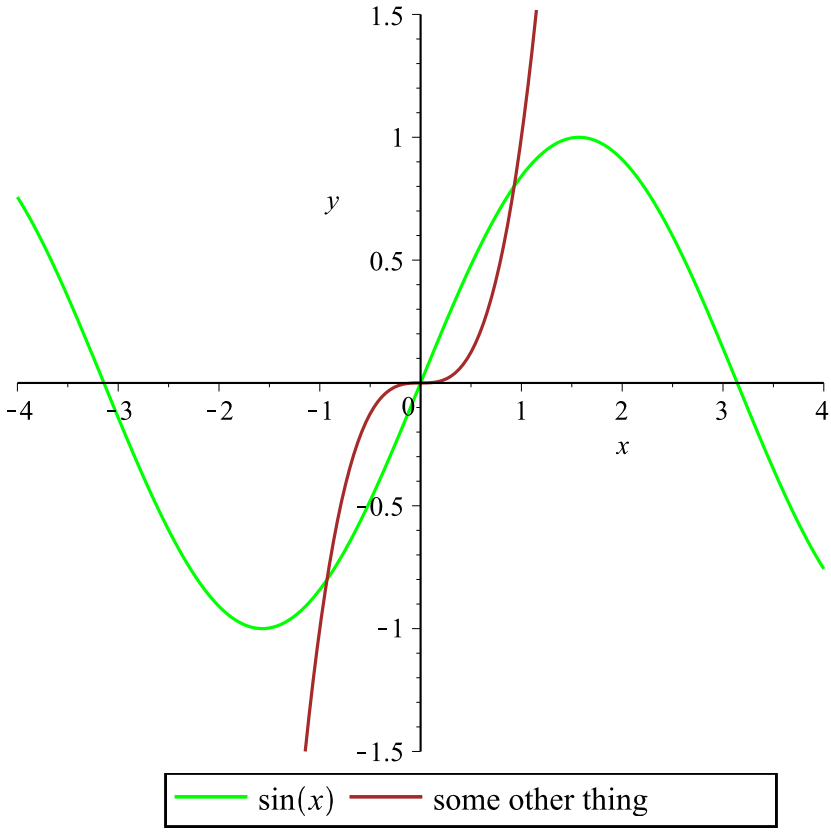
I can also produce the two plots on the same graph by giving a list of two functions to the plot command. I can also right-click and add a legend, and/or change other attributes.

```
> plot([sin(x), x^3], x=-4..4, y=-1.5..1.5, color=[green, brown]);
```



every change I can make by right clicking has a corresponding option to the command that I can specify in advance.

```
> plot( [sin(x), x^3], x =-4 ..4, y =-1.5 ..1.5, color = [green, brown], legend = [sin(x),
      "some other thing"]);
```




```
> sin(x);
```

$$\sin(x) \tag{2}$$

```
> series( (2), x, 6);
```

$$x - \frac{1}{6}x^3 + \frac{1}{120}x^5 + O(x^7) \tag{3}$$

I right-click on sin(x), and can choose "series > series > x". This gives me the Taylor series. If I want a polynomial instead of something with an order term, I can click "remove order term" and it generates the following command for me.

```
> convert( series( (2), x, 6), 'polynom')
```

$$x - \frac{1}{6}x^3 + \frac{1}{120}x^5 \tag{4}$$

```
> series( sin(x), x = Pi/2, 6)
```

$$1 - \frac{1}{2}\left(x - \frac{1}{2}\pi\right)^2 + \frac{1}{24}\left(x - \frac{1}{2}\pi\right)^4 + O\left(\left(x - \frac{1}{2}\pi\right)^6\right) \tag{5}$$

```
> fser := series(exp(x), x, 5)
```

$$fser := 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4 + O(x^5) \tag{6}$$

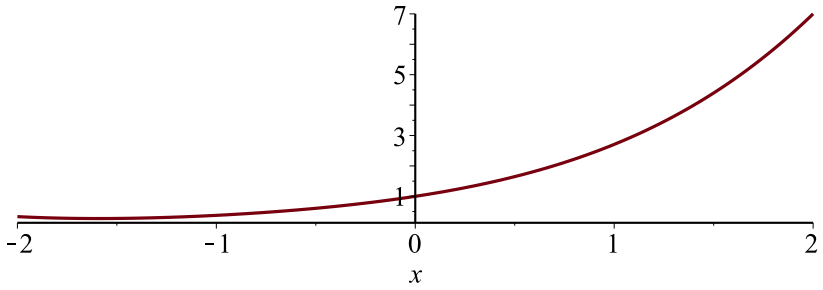
```
> f := convert(%,'polynom')
```

$$f := 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4 \quad (7)$$

```
> plot(fser, x=-2..2);
```

Error, (in plot) base power must be same throughout SERIES

```
> plot(f, x=-2..2);
```



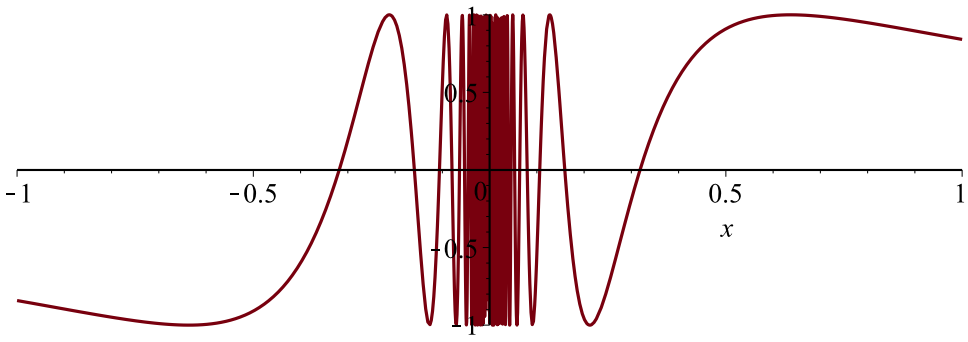

```
> exp(x);
```

$$e^x \quad (8)$$

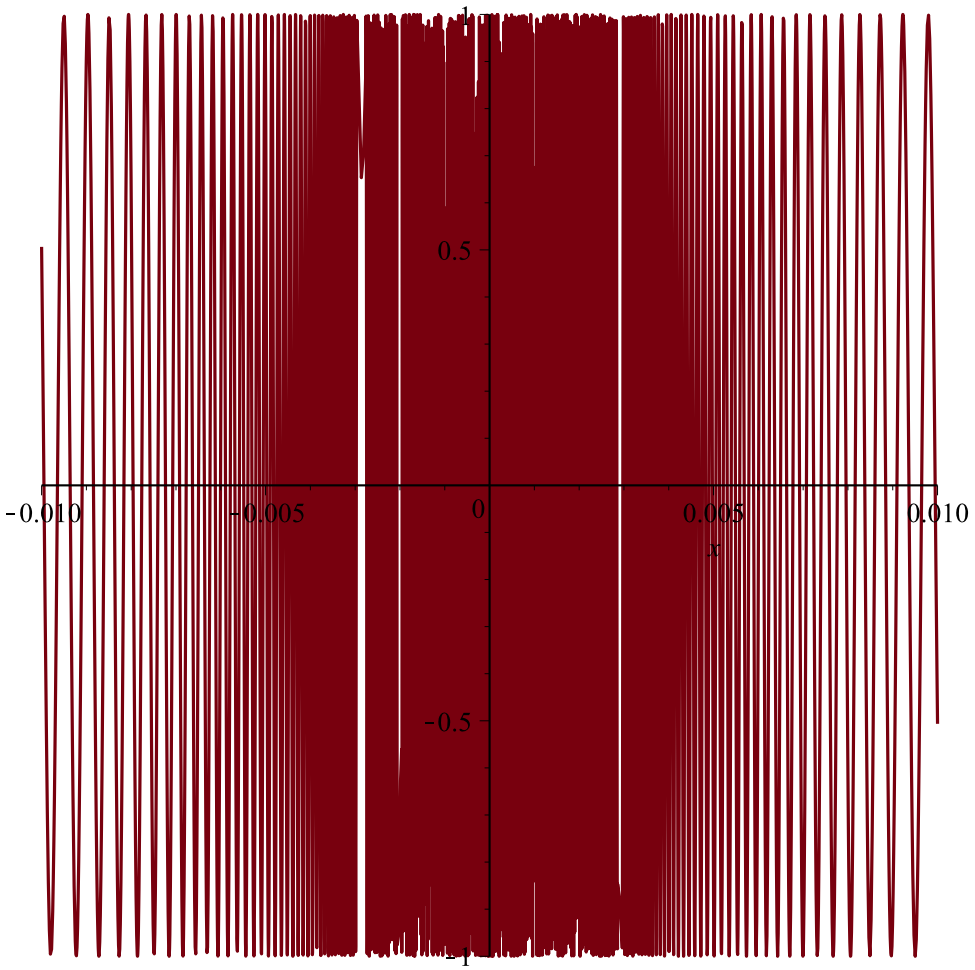
```
> convert( series( (8), x, 6), 'polynom')
```

$$1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \frac{1}{24}x^4 + \frac{1}{120}x^5 \quad (9)$$

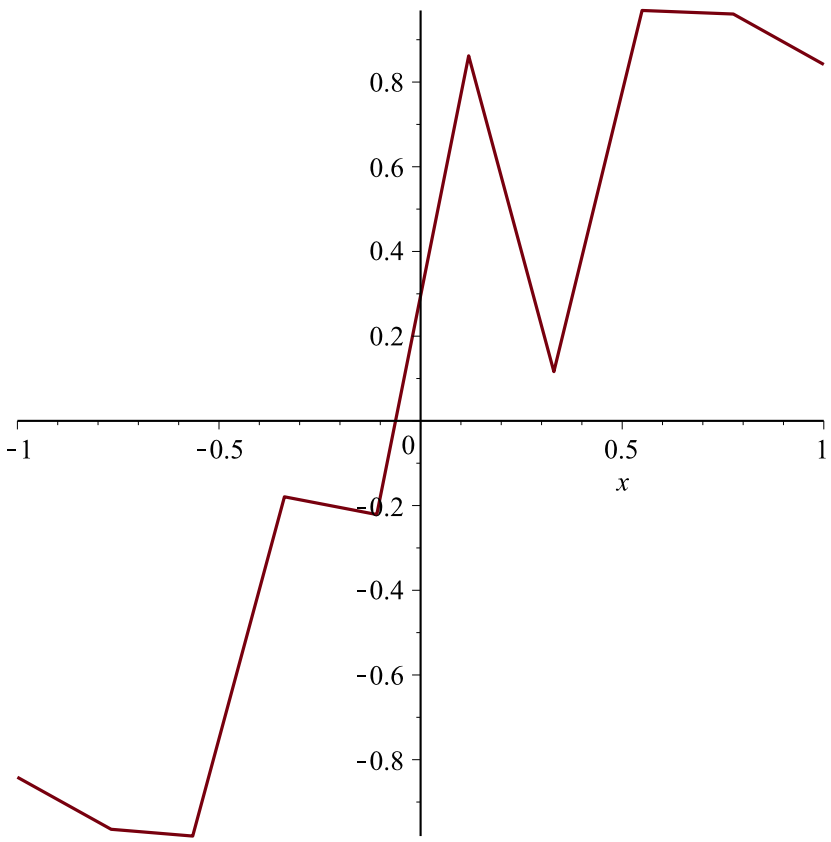
```
> plot(sin(1/x), x=-1..1);
```



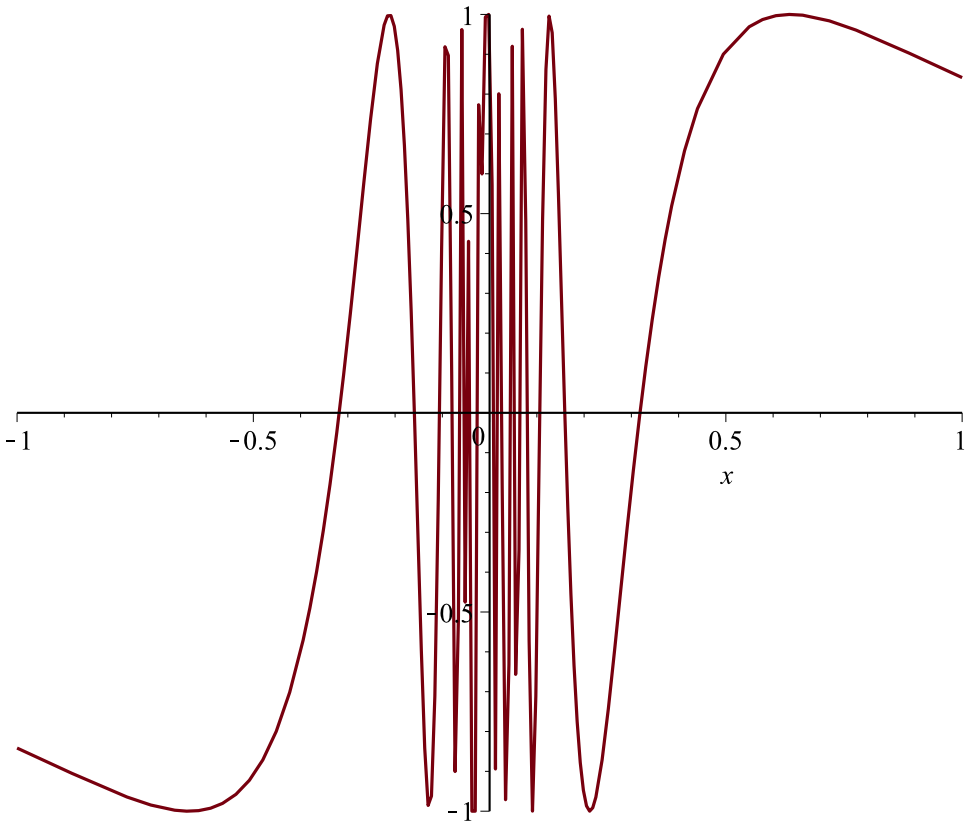

```
> plot(sin(1/x), x=-0.01..0.01);
```



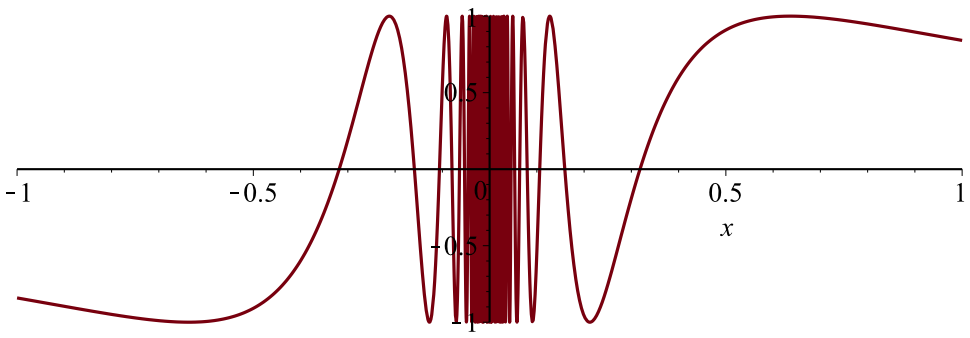
> $plot\left(\sin\left(\frac{1}{x}\right), x = -1..1, numpoints = 10, adaptive = false\right)$



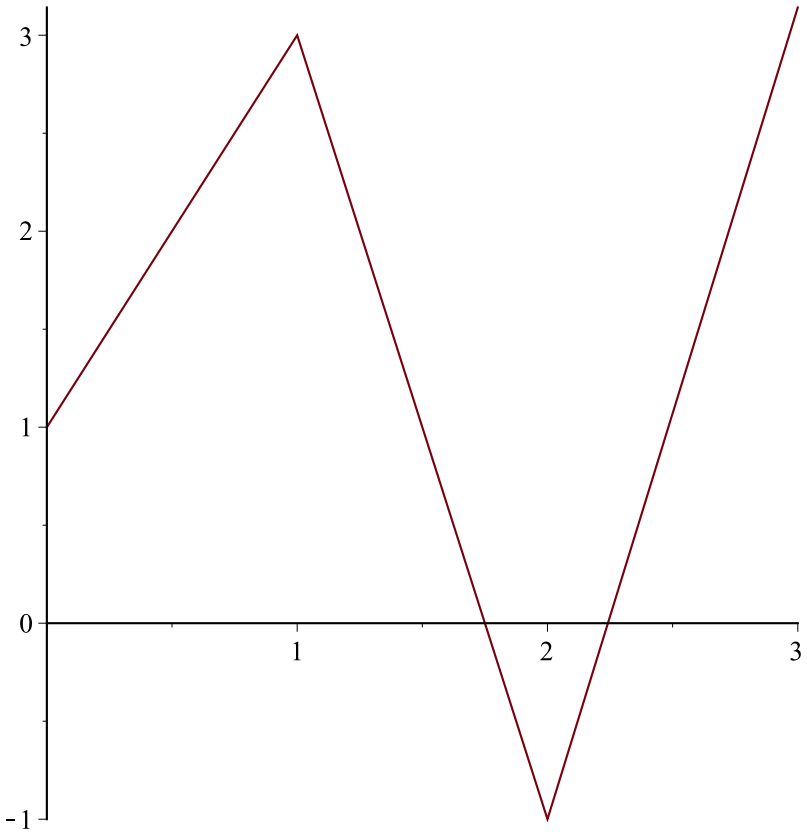
> $plot\left(\sin\left(\frac{1}{x}\right), x = -1..1, numpoints = 10\right)$



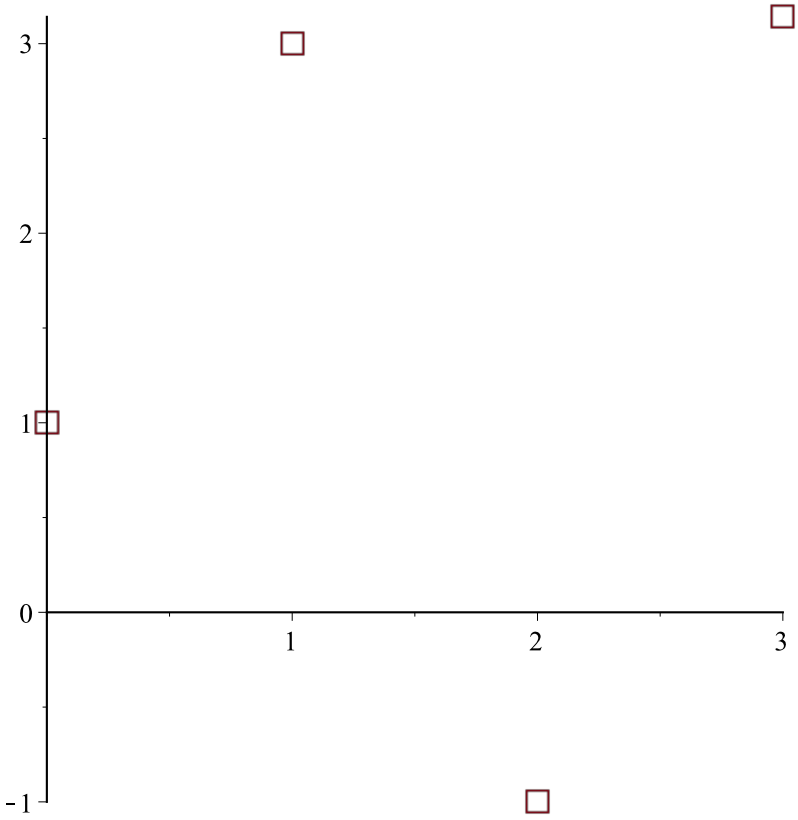
> $plot\left(\sin\left(\frac{1}{x}\right), x = -1..1, numpoints = 500\right)$



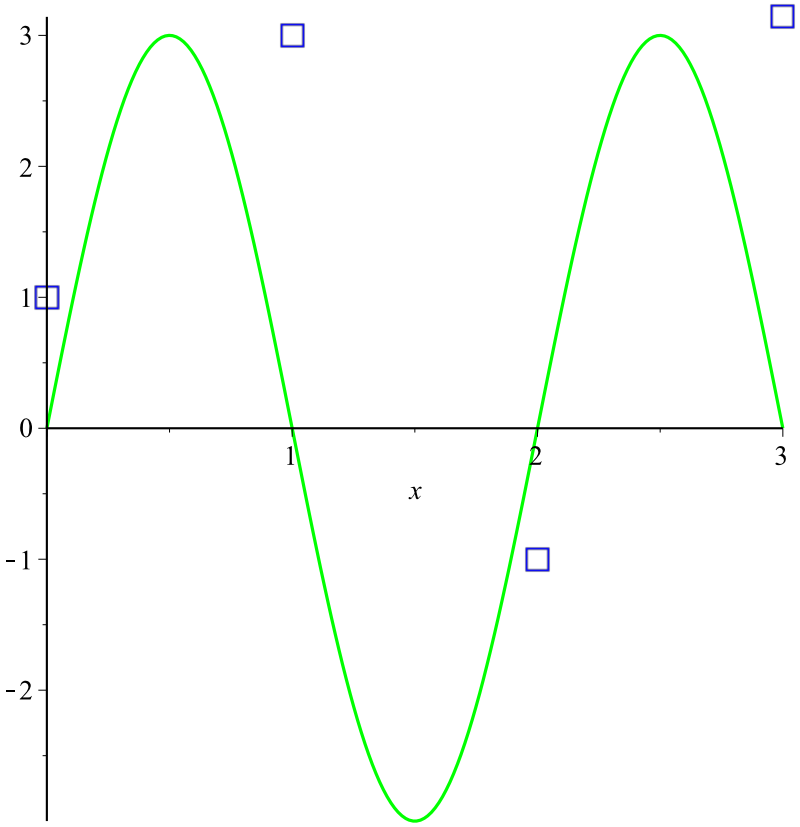
> $plot([[0, 1], [1, 3], [2, -1], [3, Pi]]);$




```
> plot( [[0, 1], [1, 3], [2, -1], [3, Pi]], style = point, symbol = box, symbolsize = 19);
```




```
> plot( [3 sin(x·Pi), [[0, 1], [1, 3], [2,-1], [3, Pi]]], x = 0 ..3, style = [line, point], symbol = box,
      symbolsize = 19, color = [green, blue]);
  ;
```



>

Wasn't that fun???

Office hours: Tues 1-3 in Math 5-112
W 11:30-12:30 Math P-143

> $data := [[0, 1], [1, 3], [2, -1], [3, 3.1]]$

$$data := [[0, 1], [1, 3], [2, -1], [3, 3.1]] \quad \textbf{(10)}$$

find a cubic polynomial passing through these 4 points..

arrow is - >

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

$$f := x \rightarrow a\,x^3 + b\,x^2 + c\,x + d \quad \textbf{(11)}$$

> $f(0) = 1$

$$d = 1 \quad \textbf{(12)}$$

> $f(1) = 3;$

(13)

$$a + b + c + d = 3 \quad (13)$$

```
> f(2) = -1;
```

$$8\,a + 4\,b + 2\,c + d = -1 \quad (14)$$

```
> f(3) = 3.1;
```

$$27\,a + 9\,b + 3\,c + d = 3.1 \quad (15)$$

```
> solve( { f(0) = 1, f(1) = 3, f(2) = -1, f(3) = 31/10 } );
```

$$\left\{a = \frac{47}{20},\ b = -\frac{201}{20},\ c = \frac{97}{10},\ d = 1\right\} \quad (16)$$

```
> subs(%, f(x));
```

$$\frac{47}{20}\,x^3 - \frac{201}{20}\,x^2 + \frac{97}{10}\,x + 1 \quad (17)$$

```
> data;
```

$$[[0, 1], [1, 3], [2, -1], [3, 3.1]] \quad (18)$$

```
> data[1];
```

$$[0, 1] \quad (19)$$

```
> data[3];
```

$$[2, -1] \quad (20)$$

```
> data[3][2];
```

$$-1 \quad (21)$$

```
> f(data[3][1]) = data[3][2]
```

$$8\,a + 4\,b + 2\,c + d = -1 \quad (22)$$

want a sequence of equations

```
> seq(i^2, i = 1..9);
```

$$1, 4, 9, 16, 25, 36, 49, 64, 81 \quad (23)$$

```
> seq(f(data[i][1]) = data[i][2], i = 1..4);
```

$$d = 1,\ a + b + c + d = 3,\ 8\,a + 4\,b + 2\,c + d = -1,\ 27\,a + 9\,b + 3\,c + d = 3.1 \quad (24)$$

```
> solve( [seq(f(data[i][1]) = data[i][2], i = 1..4)] );
```

$$\{a = 2.350000000,\ b = -10.05000000,\ c = 9.700000000,\ d = 1.\} \quad (25)$$

```
>
```