PSTricks

News - 2010

new macros and bugfixes for the basic packages `pstricks`, `pst-plot`, and `pst-node`

February 16, 2010

2010

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Contents

Part I. pstricks – package

1. General

There exists a new document class `pst-doc` for writing PSTricks documentations, like this news document. It depends on the KOMA-Script document class `scrartcl`. `pst-doc` defines a lot of special macros to create a good index. Take one of the already existing package documentation and look into the source file. Then it will be easy to understand, how all these macros have to be used.

When running `pdflatex` the title page is created with boxes and inserted with the macro `\AddToShipoutPicture` from the package `eso-pic`. It inserts the background title page image `pst-doc-pdf` to use directly `pdflatex`. When running `latex` the title page is created with `PSTricks` macros.This allows to use the Perl script `pst2pdf` or the package `pst-pdf` or `auto-pst-pdf` or any other program/package which supports `PostScript` code in the document.

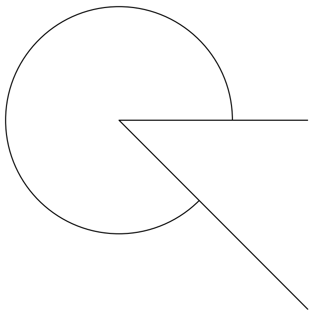
2. pstricks.sty

No changes

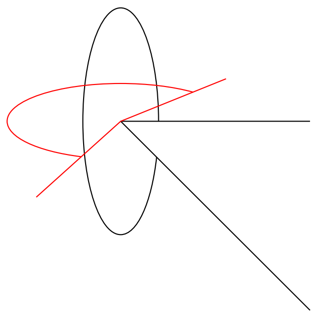
3. pstricks.tex (0.05– 2010/01/17)

3.1. Macro \psellipticarc

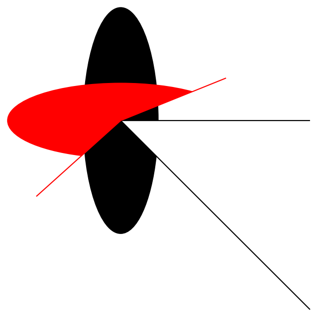
In a circle the angle is proportional to the bow: $b = r\alpha$. In an elliptic arc this is no more the case, which is the reason why angles are internally corrected by PSTricks, to get the same arc lengthts for different radii:



```
\psset{unit=0.5cm}
\begin{pspicture}(-5.5,-5.5)(5.5,5.5)%
\psset{linewidth=0.4pt,linejoin=1}
\psline(5,0)(0,0)(5,-5)
\psellipticarc(0,0)(3,3){0}{315}
\end{pspicture}%
```



```
\psset{unit=0.5cm}
\begin{pspicture}(-5.5,-5.5)(5.5,5.5)%
\psset{linewidth=0.4pt,linejoin=1}
\psline(5,0)(0,0)(5,-5)
\psellipticarc(0,0)(1,3){0}{315}%
\psset{linecolor=red}
\psellipticarc(0,0)(3,1){22}{222}%
\psline(3;22)\psline(3;222)
\end{pspicture}%
```



```
\psset{unit=0.5cm}
\begin{pspicture}(-5.5,-5.5)(5.5,5.5)%
\psset{linewidth=0.4pt,linejoin=1}
\psline(5,0)(0,0)(5,-5)
\psellipticarc*(0,0)(1,3){0}{315}%
\psset{linecolor=red}
\psellipticarc*(0,0)(3,1){22}{222}%
\psline(3;22)\psline(3;222)
\end{pspicture}%
```

3.2. Option algebraic

The option `algebraic` moved from the other packages into the main package `pstricks` to get rid of the dependencies.

By default the function in `\psplot` has to be described in Reversed Polish Notation. The option `algebraic` allows you to do this in the common algebraic notation. E.g.:

RPN	algebraic
`x ln`	`ln(x)`
`x cos 2.71 x neg 10 div exp mul`	`cos(x)*2.71^(-x/10)`
`1 x div cos 4 mul`	`4*cos(1/x)`
`t cos t sin`	`cos(t)|sin(t)`

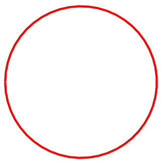
Setting the option `algebraic`, allow the user to describe all expression to be written in the classical algebraic notation (infix notation). The four arithmetic operations are obviously defined `+-*/`, and also the exponential operator `^`. The natural priorities are used : $3 + 4 \times 5^5 = 3 + (4 \times (5^5))$, and by default the computation is done from left to right. The following functions are defined :

`sin`, `cos`, `tan`, `acos`, `asin`	in radians
`log`, `ln`	
`ceiling`, `floor`, `truncate`, `round`	
`sqrt`	square root
`abs`	absolute value
`fact`	for the factorial
`Sum`	for building sums
`IfTE`	for an easy case structure

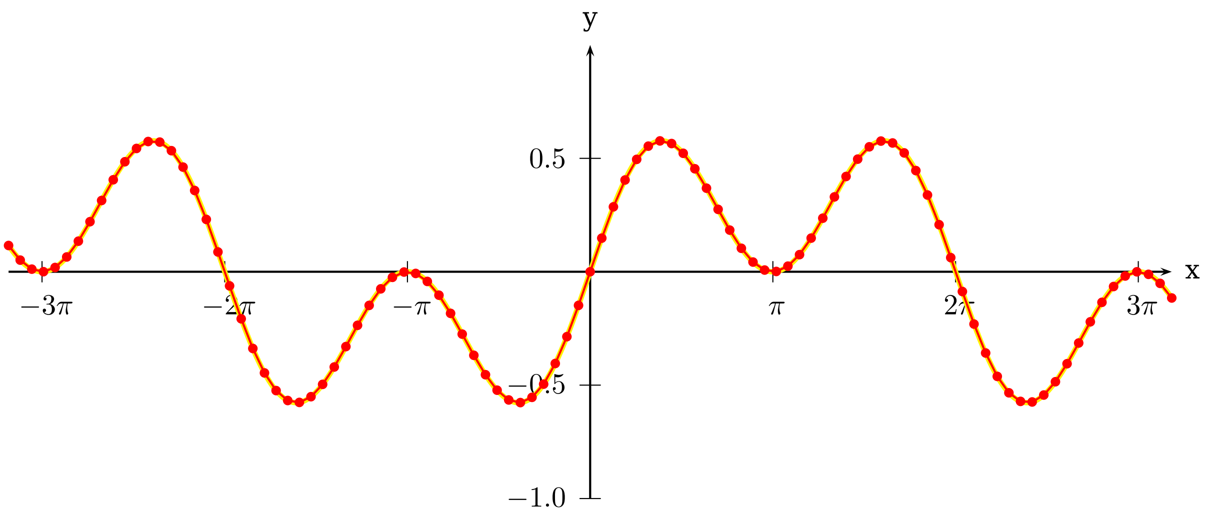
These options can be used with **all** plot macros.

Using the option `algebraic` implies that all angles have to be in radians!

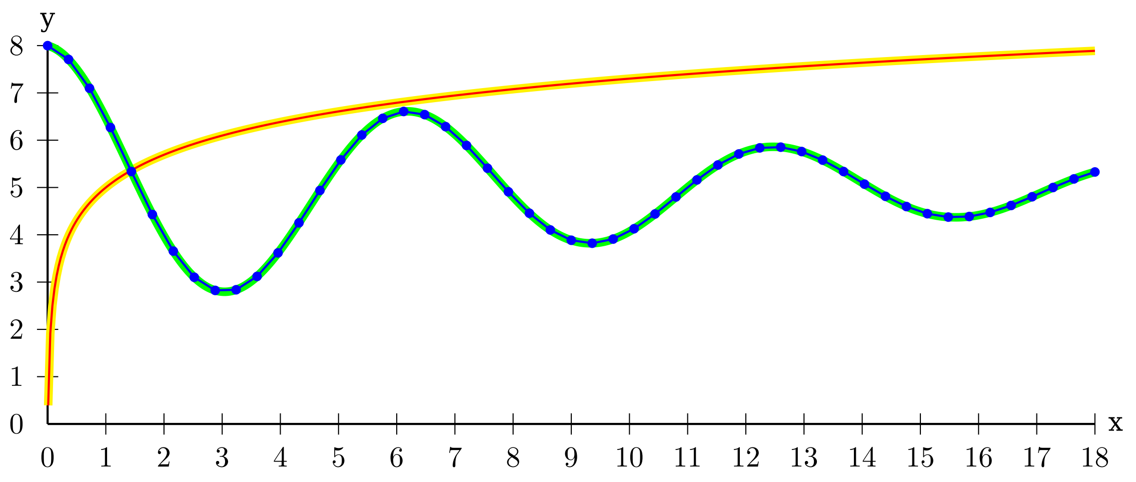
For the `\parametricplot` the two parts must be divided by the | character:



```
\begin{pspicture}(-0.5,-0.5)(0.5,0.5)
\parametricplot[algebraic,linecolor=red]{-3.14}{3.14}{cos(t)|sin(t
    )}
\end{pspicture}
```



```
\psset{lly=-0.5cm}
\psgraph[trigLabels,dx=\psPi,dy=0.5,Dy=0.5]{->}(0,0)(-10,-1)(10,1){\linewidth
    }{6cm}
  \psset{algebraic,plotpoints=1000}
  \psplot[linecolor=yellow,linewidth=2pt]{-10}{10}{0.75*sin(x)*cos(x/2)}
  \psplot[linecolor=red,showpoints=true,plotpoints=101]{-10}{10}{0.75*sin(x)*
     cos(x/2)}
\endpsgraph
```

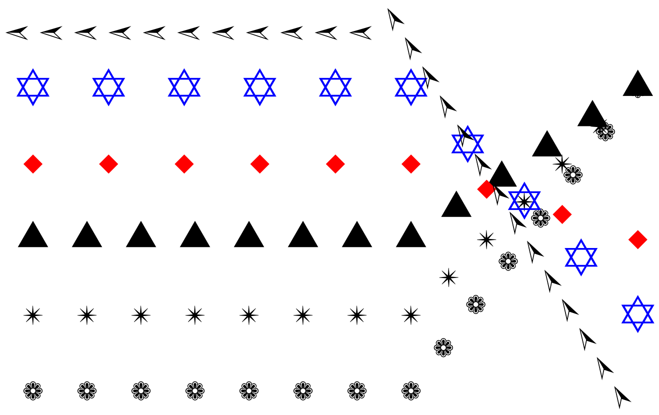


```
\psset{lly=-0.5cm}
\psgraph(0,-5)(18,3){0.9\linewidth}{5cm}
  \psset{algebraic,plotpoints=501}
  \psplot[linecolor=yellow, linewidth=4\pslinewidth]{0.01}{18}{ln(x)}
  \psplot[linecolor=red]{0.01}{18}{ln(x)}
  \psplot[linecolor=yellow,linewidth=4\pslinewidth]{0}{18}{3*cos(x)*2.71^(-x
      /10)}
  \psplot[linecolor=blue,showpoints=true,plotpoints=51]{0}{18}{3*cos(x)*2.71^(-
      x/10)}
\endpsgraph
```

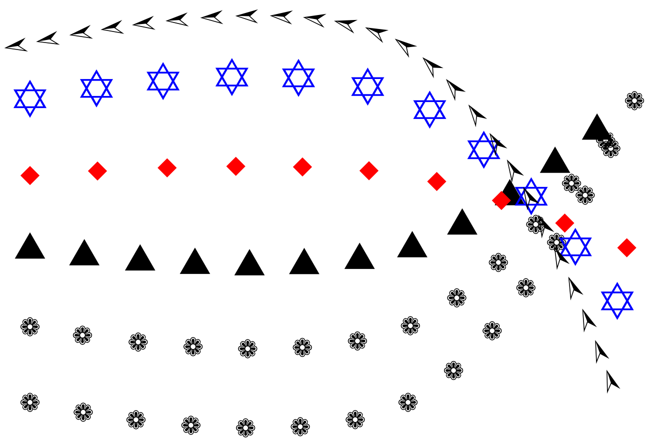
4. New linestyle symbol

Instead of drawing a continous line or curve for a series of coordinates, one can now out a symbol in a given size, direction, and step. This works only for the line style `symbol`. It takes the symbol defined by the optional argument `symbol`, which can have a single character or a octal number of three digits. The font is specified by the key `symbolFont`, which can take as argument one of the valid `PostScript` fonts or the internal `PSTricksDotFont`. If the symbol is given by a single character then the equivilant character in the given font is used. The difference between two symbols is set by `symbolStep` and the symbol rotation by `rotateSymbol`. For the first symbol there is an additional keyword `startAngle`. The default values for these new optional keywords are:

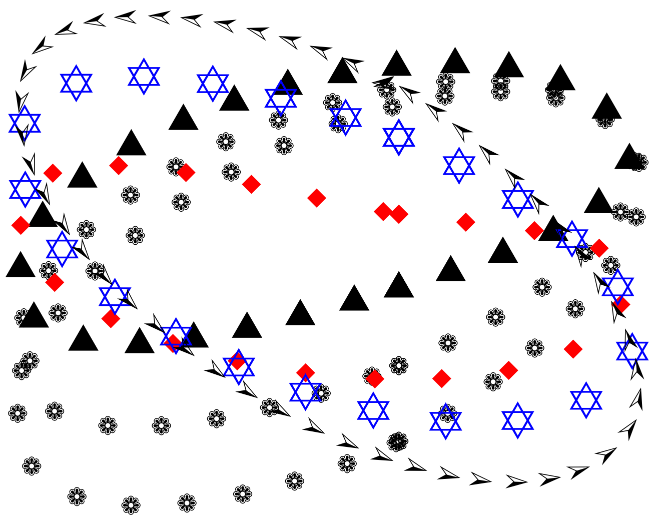
```
\psset[pstricks]{symbolStep=20pt}
\psset[pstricks]{symbolWidth=10pt}
\psset[pstricks]{symbolFont=Dingbats}
\psset[pstricks]{rotateSymbol=false}
\psset[pstricks]{startAngle=0}
```



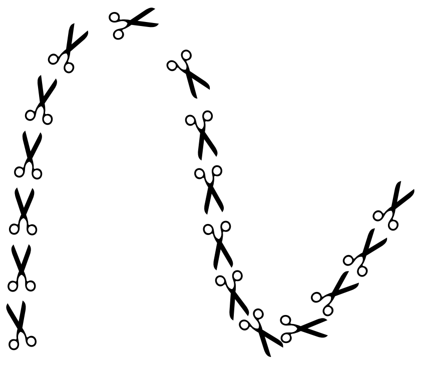
```
\pspicture(-1,-1)(8,6)
\psline[linestyle=symbol](0,0)(5,0)(8,4)
\psline[linestyle=symbol,symbol=T](0,1)(5,1)(8,4)
\psline[linestyle=symbol,symbol=u,symbolFont=PSTricksDotFont](0,2)(5,2)(8,4)
\psline[linestyle=symbol,symbol=u,symbolStep=25pt,linecolor=red](0,3)(5,3)(8,2)
\psline[linestyle=symbol,symbol=A,symbolStep=25pt,
  symbolWidth=20pt,linecolor=blue](0,4)(5,4)(8,1)
\psline[linestyle=symbol,symbol=342,rotateSymbol=true,symbolStep=12pt](0,5)
    (5,5)(8,0)
\endpspicture
```



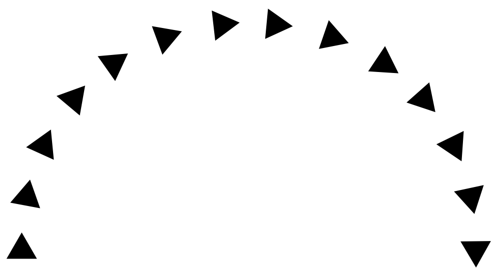
```
\pspicture(-1,-1)(8,6)
\pscurve[linestyle=symbol](0,0)(5,0)(8,4)
\pscurve[linestyle=symbol](0,1)(5,1)(8,4)
\pscurve[linestyle=symbol,symbol=u,symbolFont=PSTricksDotFont](0,2)(5,2)(8,4)
\pscurve[linestyle=symbol,symbol=u,symbolStep=25pt,linecolor=red](0,3)(5,3)
    (8,2)
\pscurve[linestyle=symbol,symbol=A,symbolStep=25pt,
  symbolWidth=20pt,linecolor=blue](0,4)(5,4)(8,1)
\pscurve[linestyle=symbol,symbol=342,rotateSymbol=true,
  startAngle=190,symbolStep=12pt](0,5)(5,5)(8,0)
\endpspicture
```



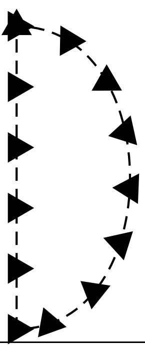
```
\pspicture(-1,-1)(8,6)
\psccurve[linestyle=symbol](0,0)(5,0)(8,4)
\psccurve[linestyle=symbol](0,1)(5,1)(8,4)
\psccurve[linestyle=symbol,symbol=u,symbolFont=PSTricksDotFont](0,2)(5,2)(8,4)
\psccurve[linestyle=symbol,symbol=u,symbolStep=25pt,linecolor=red](0,3)(5,3)
    (8,2)
\psccurve[linestyle=symbol,symbol=A,symbolStep=25pt,
  symbolWidth=20pt,linecolor=blue](0,4)(5,4)(8,1)
\psccurve[linestyle=symbol,symbol=342,rotateSymbol=true,
  startAngle=190,symbolStep=12pt](0,5)(5,5)(8,0)
\endpspicture
```



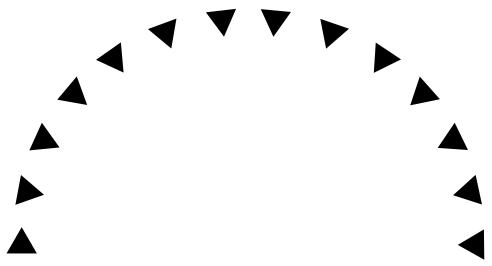
```
\pspicture(-1,-1)(5,4)
\pscurve[rotateSymbol=true,linestyle=symbol,
  rot=180,startAngle=100,symbol=",
    symbolWidth=20pt](0,0)(1,4)(3,0)(5,2)
\endpspicture
```



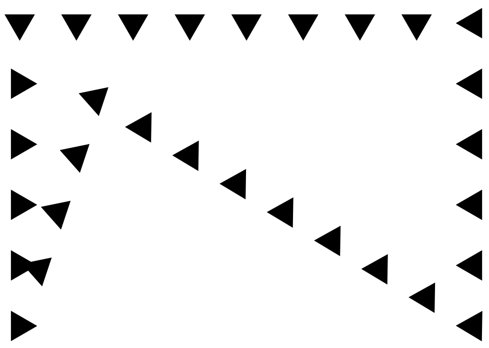
```
\pspicture(-1,-1)(6,4)
\psbezier[rotateSymbol=true,linestyle=symbol,symbol=u,
 symbolFont=PSTricksDotFont,rot=-90,startAngle=0](0,0)(0,4)(6,4)(6,0)
\endpspicture
```



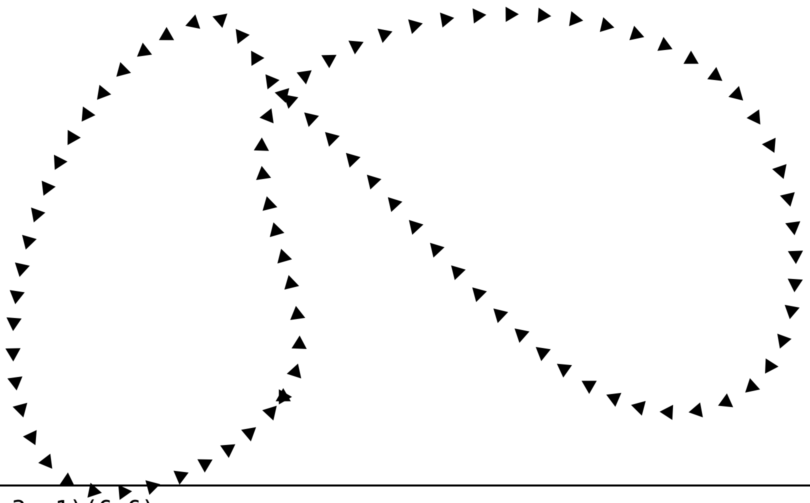
```
\psset{unit=0.5cm}
\pspicture(-1,-4)(6,4)
\pscbezier[rotateSymbol=true,linestyle=symbol,symbol=u,
 symbolFont=PSTricksDotFont](0,4)(4,4)(4,-4)(0,-4)
\pscbezier[linestyle=dashed](0,4)(4,4)(4,-4)(0,-4)
\endpspicture
```



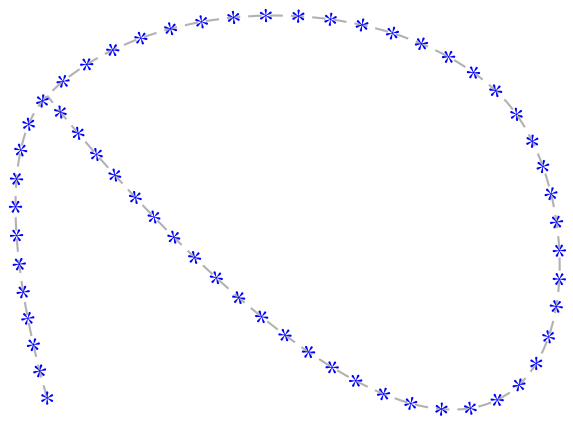
```
\pspicture(-1,-1)(6,4)
\psbezier[rotateSymbol=true,linestyle=symbol,symbol=u,
 symbolFont=PSTricksDotFont](0,0)(0,4)(6,4)(6,0)
\endpspicture
```



```
\pspicture(-1,-1)(6,4)
\pspolygon[rotateSymbol=true,linestyle=symbol,symbol=u,
 symbolFont=PSTricksDotFont](0,0)(0,4)(6,4)(6,0)(1,3)
\endpspicture
```



```
\pspicture(-3,-1)(6,6)
\psccurve[linestyle=symbol,symbol=u, rot=-90,rotateSymbol,
  symbolFont=PSTricksDotFont, symbolWidth=5pt, symbolStep=10pt
](-3,-1)(0,0)(0,4)(6,4)(6,0)(0,4)(-1,5)
\endpspicture
```



```
\pspicture(-1,-1)(6,6)
\pscurve[linestyle=dashed,linecolor=black!30](0,0)(0,4)(6,4)(6,0)(0,4)
\pscurve[rotateSymbol=true,linestyle=symbol,symbol=k,
  symbolFont=PSTricksDotFont, symbolWidth=5pt, symbolStep=10pt,linecolor=blue
](0,0)(0,4)(6,4)(6,0)(0,4)
\endpspicture
```

5. Numeric functions

All macros have a @ in their name, because they are only for internal use, but it is no problem to use them like other macros. One can define another name without a @:

```
\makeatletter
\let\pstdivide\pst@divide
\makeatother
```

or put the macro inside the `\makeatletter` – `\makeatother` sequence.

6. Numeric functions

By default PSTricks loads the file `pst-fp` which is derived from the `fp` package. It supports the following macros:

6.1. `\pstFPadd`, `\pstFPsub`, `\pstFPmul`, and `\pstFPdiv`

Multiplication and division:

```
\pstFPadd{result}{number}{number}
\pstFPsub{result}{number}{number}
\pstFPmul{result}{number}{number}
\pstFPdiv{result}{number}{number}
```

```
-0.079847250000000000
-145.202558635394456289
-0.079847250000000000
-0.006886930983847283
7726.059000000000000000
7.094636363636363636
267.123000000000000000
201.123000000000000000
201.123000000000000000
-267.123000000000000000
```

```
\pstFPmul\Result{-3.405}{0.02345} \Result\quad
\pstFPdiv\Result{-3.405}{0.02345} \Result\\
\pstFPmul\Result{0.02345}{-3.405} \Result\quad
\pstFPdiv\Result{0.02345}{-3.405} \Result\\
\pstFPmul\Result{234.123}{33} \Result\quad
\pstFPdiv\Result{234.123}{33} \Result\\
\pstFPadd\Result{234.123}{33} \Result\quad
\pstFPadd\Result{234.123}{-33} \Result\\
\pstFPsub\Result{234.123}{33} \Result\quad
\pstFPsub\Result{-234.123}{33} \Result
```

The zeros can be stripped with the macro `\pstFPstripZeros`. Expect always rounding errors, TEX was not made for calculations . . . The value is converted into a length and then reconverted to a number by stripping the unit. Which also strips the zeros.

```
-0.07985   -145.20256
-0.07985   -0.00688
```

```
\pstFPmul\Result{-3.405}{0.02345}
\pstFPstripZeros{\Result}{\Result}\Result\quad
\pstFPdiv\Result{-3.405}{0.02345}
\pstFPstripZeros{\Result}{\Result}\Result\\
\pstFPmul\Result{0.02345}{-3.405}
\pstFPstripZeros{\Result}{\Result}\Result\quad
\pstFPdiv\Result{0.02345}{-3.405}
\pstFPstripZeros{\Result}{\Result}\Result
```

6.2. `\pstFPMul` and `\pstFPDiv`

Integer multiplication and division:

```
\pstFPMul{result as a truncated integer}{number}{number}
\pstFPDiv{result as a truncated integer}{number}{number}
```

```
-0    -145
-79    -6
7726    7
```

```
\makeatletter
\pstFPMul\Result{-34.05}{0.02345} \Result\quad
\pstFPDiv\Result{-3.405}{0.02345} \Result\\
\pstFPMul\Result{23.45}{-3.405} \Result\quad
\pstFPDiv\Result{0.2345}{-0.03405} \Result\\
\pstFPMul\Result{234.123}{33} \Result\quad
\pstFPDiv\Result{234.123}{33} \Result
\makeatother
```

7. The PostScript header files

7.1. `pstricks.pro`

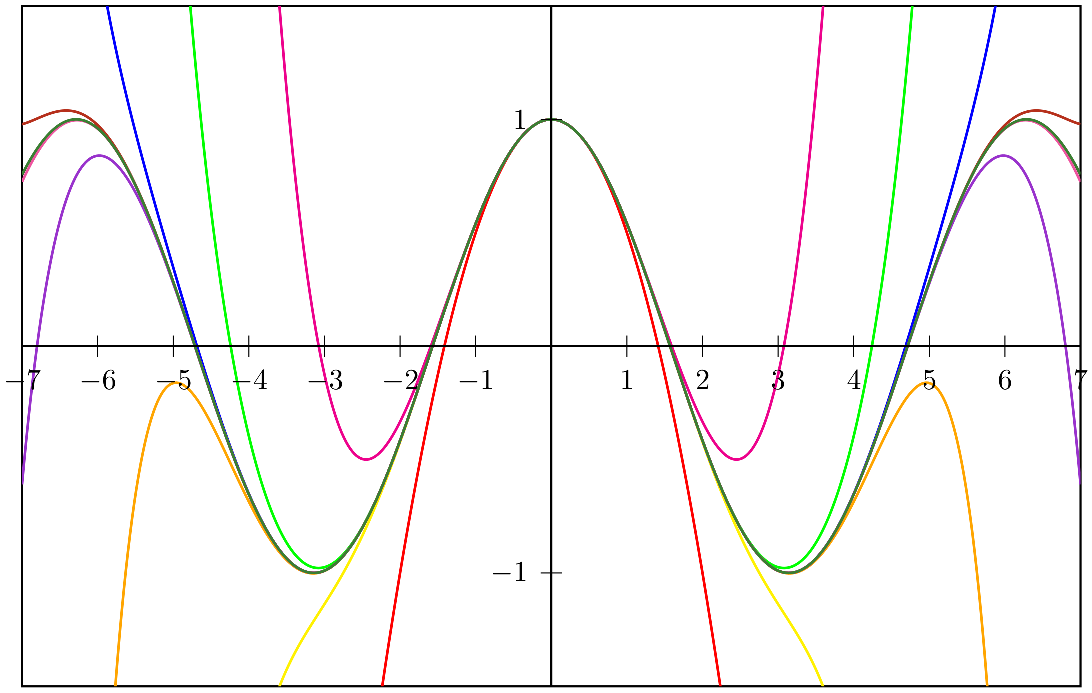
It contains now most of the stuff from `pstricks-add` and the new routines for plotting lines/curves with symbols.

7.2. pst-algparser.pro

Using the Sum function

```
\Sum(<index name>,<start>,<step>,<end>,<function>)
```

Let’s plot the first development of cosine with polynomials: $\sum_{n=0}^{+\infty} \frac{(-1)^n x^{2n}}{n!}$.

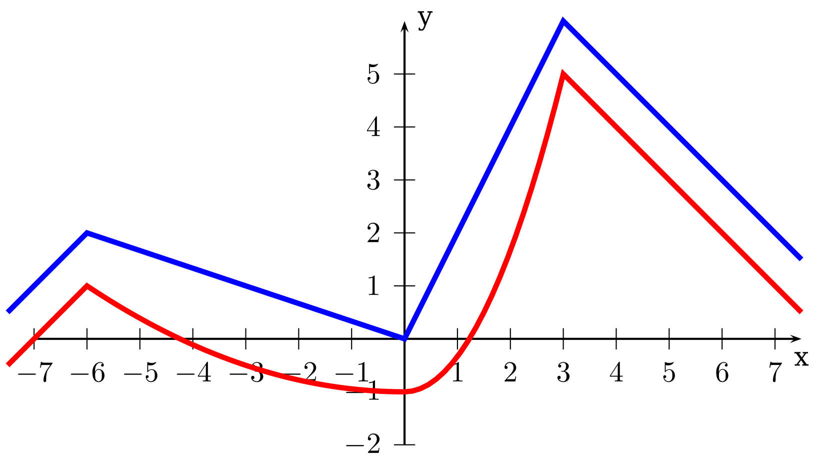


```
\psset{algebraic=true, plotpoints=501, yunit=3}
\def\getColor#1{\ifcase#1 black\or red\or magenta\or yellow\or green\or Orange\
   or blue\or
 DarkOrchid\or BrickRed\or Rhodamine\or OliveGreen\fi}
\begin{pspicture}(-7,-1.5)(7,1.5)
 \psclip{\psframe(-7,-1.5)(7,1.5)}
   \psplot{-7}{7}{cos(x)}
   \multido{\n=1+1}{10}{%
     \psplot[linewidth=1pt,linecolor=\getColor{\n}]{-7}{7}{%
        Sum(ijk,0,1,\n,(-1)^ijk*x^(2*ijk)/fact(2*ijk))}}
  \endpsclip
 \psaxes(0,0)(-7,-1.5)(7,1.5)
\end{pspicture}
```

7.3. The variable step algorithm together with the PostScript function IfTE

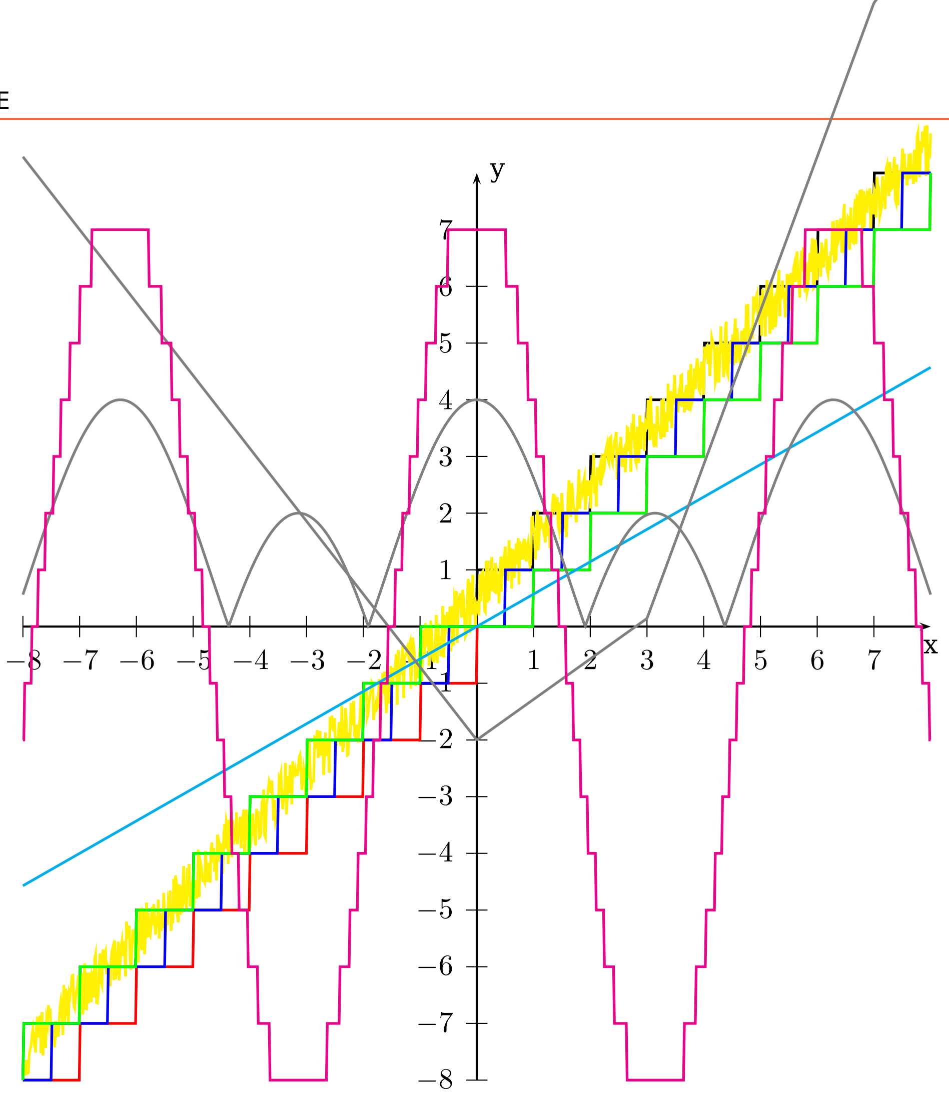
```
IfTE(<condition>,<true part>,<false part>)
```

Nesting of several `IfTE` is possible and seen in the following examples. A classic example is a piece-wise linear function.



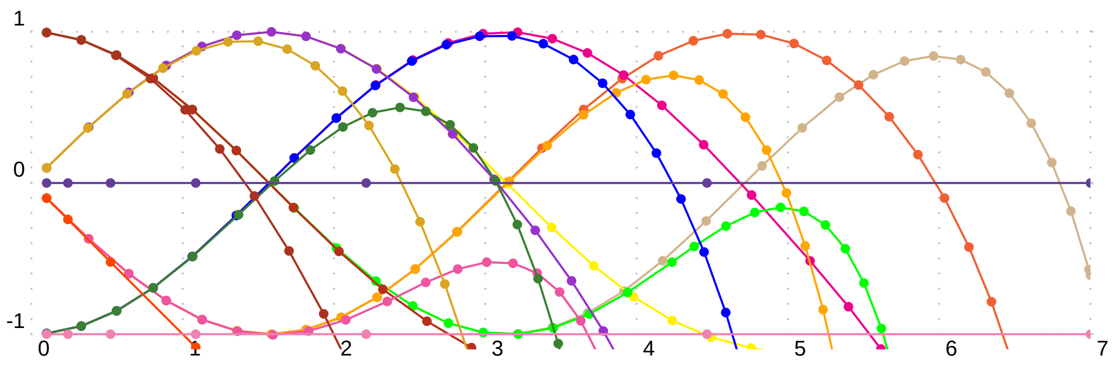
```
\psset{unit=1.5, algebraic, VarStep, showpoints, VarStepEpsilon=.001}
\begin{pspicture}[showgrid=true](-7,-2)(2,4)
 \psplot{-7}{2}{IfTE(x<-5,-(x+5)^3/2,IfTE(x<0,0,x^2))}
 \psplot{-7}{2}{5*x/9+26/9}
 \psplot[linecolor=blue]{-7}{2}{(x+7)^30/9^30*4.5-1/2}
 \psplot[linecolor=red]{-6.9}{2}
    {IfTE(x<-6,ln(x+7),IfTE(x<-3,x+6,IfTE(x<0.1415926,sin(x+3)+3,3.1415926-x))
        )}
\end{pspicture}
```

When you program a piece-wise defined function you must take care that a plotting point must be put at each point where the description changes. Use `showpoints=true` to see what's going on when there is a problem. You are on the safe side when you choose a big number for `plotpoints`.



```
\psset{unit=0.75}
\begin{pspicture}(-8,-8)(8,8)
  \psaxes{->}(0,0)(-8,-8)(8,8)[x,-90][y,0]
  \psset{plotpoints=1000,linewidth=1pt}
  \psplot[algebraic=true, linecolor=yellow]{-8}{8}{rand/(2^31-1)+x}
  \psplot[algebraic=true]{-8}{8}{ceiling(x)}
  \psplot[algebraic=true, linecolor=red]{-8}{8}{floor(x)}
  \psplot[algebraic=true, linecolor=blue]{-8}{8}{round(x)}
  \psplot[algebraic=true, linecolor=green]{-8}{8}{truncate(x)}
  \psplot[algebraic=true, linecolor=cyan]{-8}{8}{div(mul(4,x),7)}
  \psplot[algebraic=true, linecolor=gray]{-8}{8}{abs(x)+abs(x-3)-abs(5-5*x/7)}
  \psplot[algebraic=true, linecolor=gray]{-8}{8}{abs(3*cos(x)+1)}
  \psplot[algebraic=true, linecolor=magenta]{-8}{8}{floor(8*cos(x))}
\end{pspicture}
```

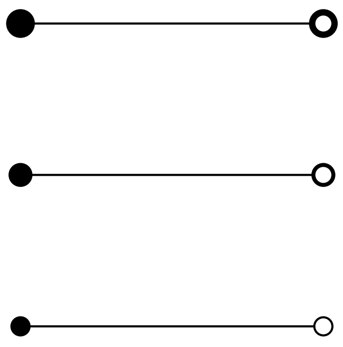
7.4. Successive derivatives of a polynomial with the PostScript function `Derive`



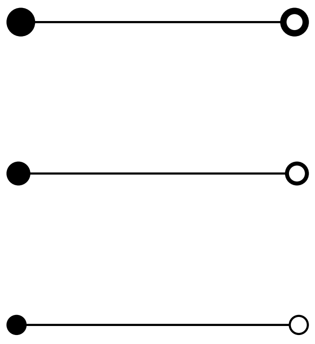
```
\psset{unit=2, algebraic=true, VarStep=true, showpoints=true, VarStepEpsilon
   =.001}
\def\getColor#1{\ifcase#1 Tan\or RedOrange\or magenta\or yellow\or green\or
   Orange\or blue\or
 DarkOrchid\or BrickRed\or Rhodamine\or OliveGreen\or Goldenrod\or Mahogany\or
 OrangeRed\or CarnationPink\or RoyalPurple\or Lavender\fi}
\begin{pspicture}[showgrid=true](0,-1.2)(7,1.5)
 \psclip{\psframe[linestyle=none](0,-1.1)(7,1.1)}
 \multido{\in=0+1}{16}{%
  \psplot[algebraic=true, linecolor=\getColor{\in}]{0.1}{7}
  {Derive(\in,Sum(i,0,1,7,(-1)^i*x^(2*i)/Fact(2*i)))}}
 \endpsclip
\end{pspicture}
```

7.5. Special arrow option `arrowLW`

Only for the arrowtype `o`, `oo`, `*`, and `**` it is possible to set the arrowlinewidth with the optional keyword `arrowLW`. When scaling an arrow by the keyword `arrowscale` the width of the borderline is also scaled. With the optional argument `arrowLW` the line width can be set separately and is not taken into account by the scaling value.



```
\begin{pspicture}(4,6)
\psline[arrowscale=3,arrows=*-o](0,5)(4,5)
\psline[arrowscale=3,arrows=*-o,
 arrowLW=0.5pt](0,3)(4,3)
\psline[arrowscale=3,arrows=*-o,
 arrowLW=0.3333\pslinewidth](0,1)(4,1)
\end{pspicture}
```



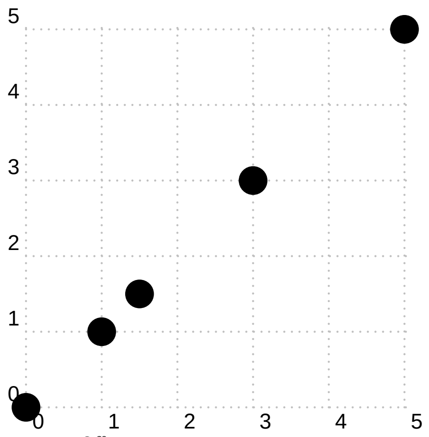
```
\begin{pspicture}(4,6)
\psline[arrowscale=3,arrows=**-oo](0,5)(4,5)
\psline[arrowscale=3,arrows=**-oo,
  arrowLW=0.5pt](0,3)(4,3)
\psline[arrowscale=3,arrows=**-oo,
  arrowLW=0.3333\pslinewidth](0,1)(4,1)
\end{pspicture}
```

8. \psforeach and \psForeach

The macro `\psforeach` allows a loop with an individual increment.

```
\psforeach{variable}{value list}{action}
\psForeach{variable}{value list}{action}
```

With `\psforeach` the *action* is done inside a group and for `\psForeach` not. This maybe useful when using the macro to create tabular cells, which are alread grouped itself.



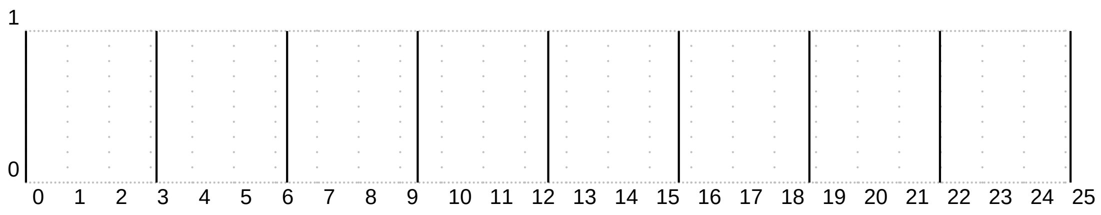
```
\begin{pspicture}[showgrid=true](5,5)
  \psforeach{\nA}{0, 1, 1.5, 3, 5}{%
    \psdot[dotscale=3](\nA,\nA)}
\end{pspicture}
```

$y = 2^x$

2	4	6	8	10	12
4.0	16.0	64.0	256.0	1024.0	4096.0

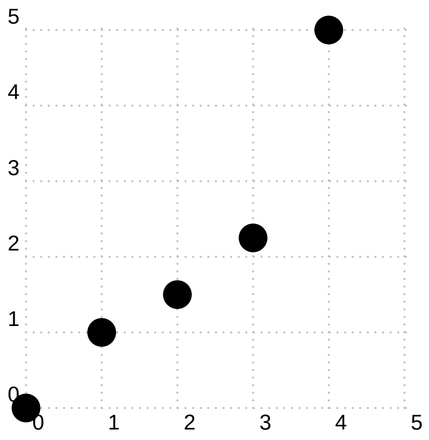
```
%\usepackage{pst-func}
\makeatletter
\newcommand*\InitToks{\toks@={}}
\newcommand\AddToks[1]{\toks@=\expandafter{\the\toks@ #1}}
\newcommand*\PrintToks{\the\toks@}
\newcommand*{\makeTable}[4][5mm]{%
  \begingroup
    \InitToks%
    \AddToks{\begin{tabular}{|*{#2}{>{\RaggedLeft}p{#1}|}@{}l@{}}\cline{1-#2}}
    \psForeach{\iA}{#3}{\expandafter\AddToks\expandafter{\iA & }}
    \AddToks{\\\cline{1-#2}}%
    \psForeach{\iA}{#3}{\expandafter\AddToks\expandafter{\expandafter%
      \psPrintValue\expandafter{\iA\space /x ED #4} & }}
    \AddToks{\\\cline{1-#2}\end{tabular}}%
    \PrintToks
  \endgroup
}
\makeatother

\sffamily
\psset{decimals=2,valuewidth=7,xShift=-20}
$y=2^x$\\
\makeTable[1cm]{6}{2,4,6,8,10,12}{2 x exp}
```

The value List can also be given by the first two and the last value, e.g. `1,4,..,31`, then PSTricks calculates all values with the distance given by the first two values.



```
\psset{xunit=0.55cm,yunit=2cm}
\begin{pspicture}[showgrid](0,-5mm)(25,1)
 \psforeach{\nA}{0, 3.14,..,25}{\psline(\nA,0)(\nA,1)}
\end{pspicture}
```

The internal counter for the steps is named `psLoopIndex` and can be used for own purposes.



```
\begin{pspicture}[showgrid=true](5,5)
\psforeach{\nA}{0, 1, 1.5, 2.25, 5}{%
 \psdot[dotscale=3](\the\psLoopIndex,\nA)}
\end{pspicture}
```

Part II. pst-node – package

9. pst-node.tex

The package `pst-node` now uses the advanced key handling from `xkeyval`. The reason why it moved from the base into the contrib sections, where all packages uses `xkeyval`.

Part III. pst-plot – package

10. pst-plot.tex

The package `pst-plot` now uses the advanced key handling from `xkeyval`. The reason why it moved from the base into the contrib sections, where all packages uses `xkeyval`.

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