PGFplots

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Introduction to PGFplots

PGFplots...

- provides tools to generate plots
- is built completely on Ti*k*Z/PGF
- helps maintain consistency of document and font type/size
- claims to be user-friendly ! (*Really ?!*)

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  YES, after you master the 238 page manual !

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- claims to be user-friendly ! (*Really ?!*)
  YES, after you master the 238 page manual !
- I would rather do it on MATLAB

Nevertheless, PGFplots produces good quality plots

The basics

These are mandatory

- \usepackage{pgfplots} in the preamble

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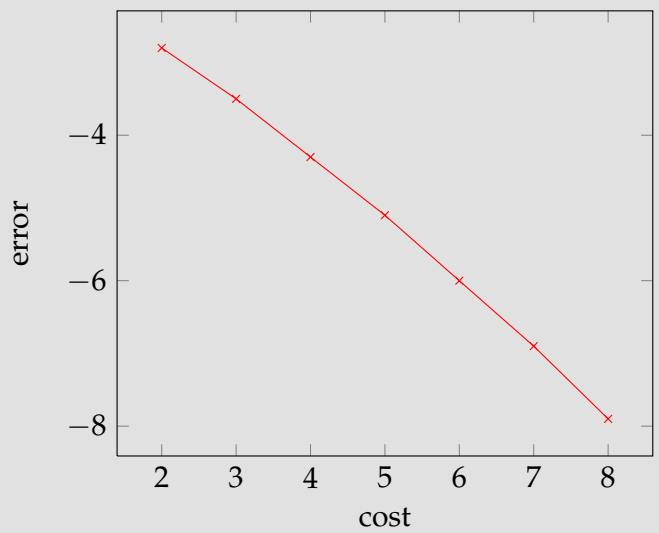
- \usepackage{pgfplots} in the preamble
- \begin{tikzpicture}
  \begin{axis}
  ...
  \end{axis}
  \end{tikzpicture} within the document

A simple (scatter) plot

Plot

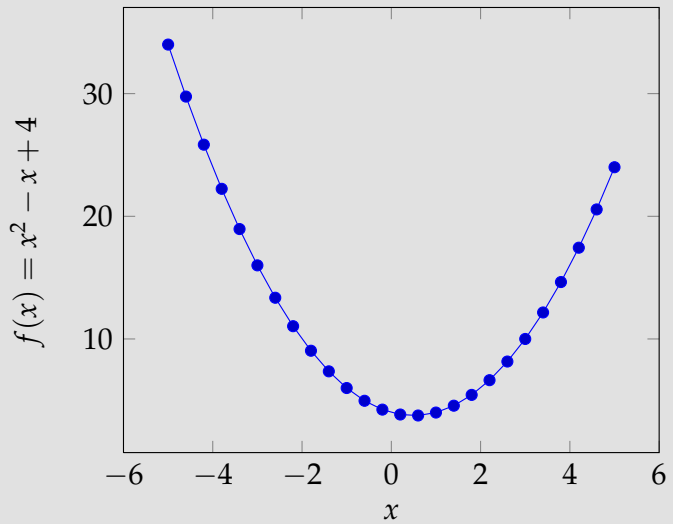


Code

```
\begin{tikzpicture}
\begin{axis}[
xlabel=cost,
ylabel=error
]
\addplot[color=red, mark=x]
coordinates{
(2, -2.8)
(3, -3.5)
(4, -4.3)
(5, -5.1)
(6, -6)
(7, -6.9)
(8, -7.9)


};

\end{axis}
\end{tikzpicture}
```

Ploting expressions

Plot

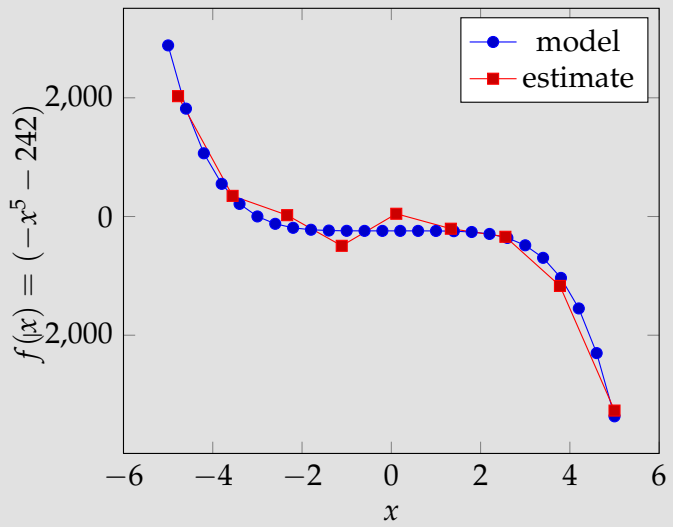


Code

```
\begin{tikzpicture}
\begin{axis}[
xlabel=$x$,
ylabel={$f(x)=x^2-x+4$}
]

        \addplot{x^2-x+4};

\end{axis}
\end{tikzpicture}
```

Multiple plots & Legend

Plot

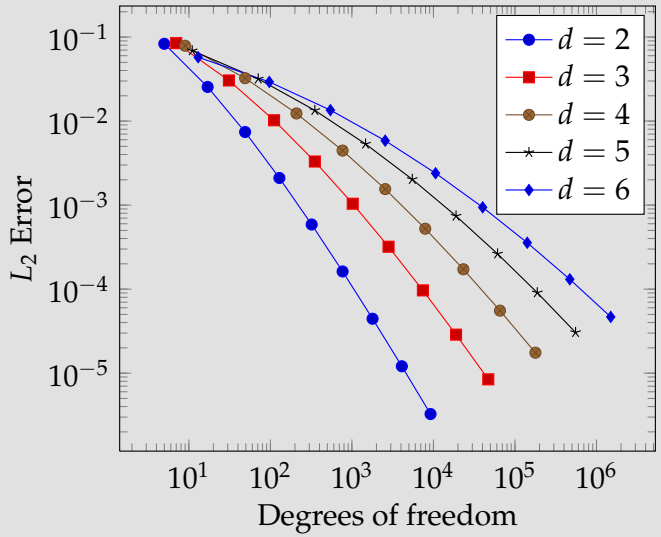


Code

```
\begin{tikzpicture}
\begin{axis}[
xlabel=$x$,
ylabel={$f(x)=(-x^5-242)$}
]
\addplot{-x^5-242};

\addlegendentry{model}

\addplot coordinates{
(-4.77778,2027.60977)
(-3.55556,347.84069)
(-2.33333,22.58953)
(-1.11111,-493.50066)
(0.11111,46.66082)
(1.33333,-205.56286)
(2.55556,-341.40638)
(3.77778,-1169.24780)
(5.00000,-3269.56775)
};

\addlegendentry{estimate}

\end{axis}
\end{tikzpicture}
```

Easy legend entry

Plot

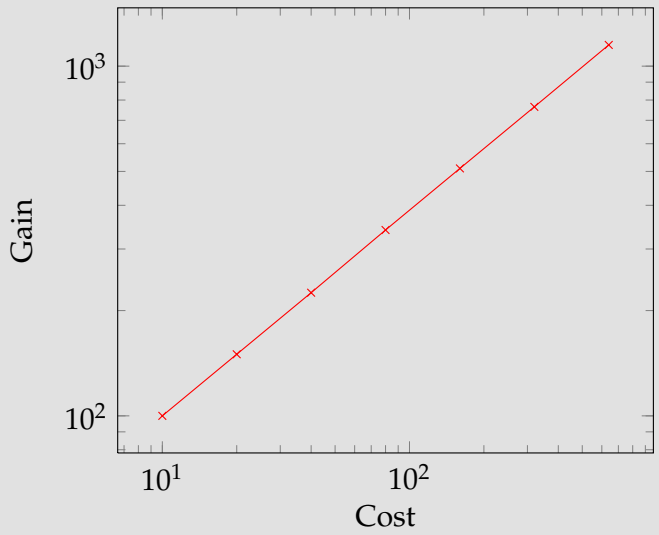


Code

```
\begin{tikzpicture}
\begin{loglogaxis}[
xlabel={Degrees of freedom},
ylabel={$L_2$ Error}
]
\addplot coordinates {
(5,8.312e-02). . .
(129,2.102e-03). . .
(1793,4.442e-05). . .
};
\addplot coordinates{
. . .
};
\addplot coordinates{
. . .
};
\addplot coordinates{
. . .
};
\addplot coordinates{
. . .
};


\legend{$d=2$,$d=3$,$d=4$,$d=5$,$d=6$}

\end{loglogaxis}
\end{tikzpicture}
```

Log axis

Plot

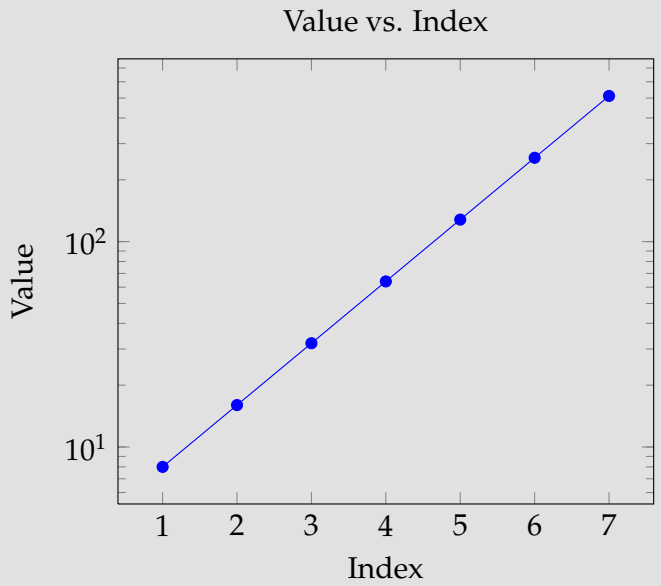


Code

```
\begin{tikzpicture}

\begin{loglogaxis}

[xlabel=Cost,ylabel=Gain]
\addplot[color=red,mark=x]
coordinates {
(10,100)
(20,150)
(40,225)
(80,340)
(160,510)
(320,765)
(640,1150)
};
\end{loglogaxis}
\end{tikzpicture}
```

Semilog axis

Plot

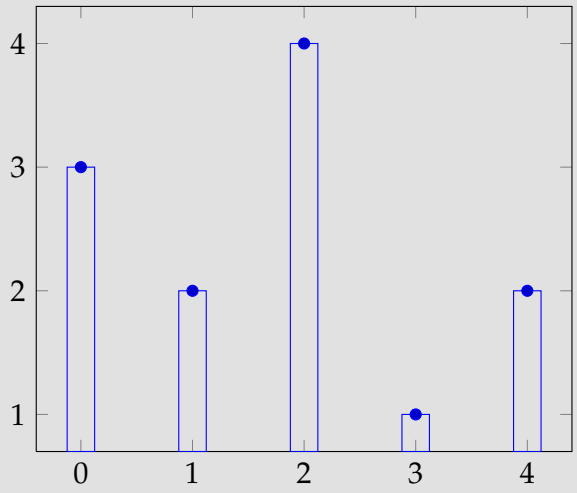


Code

```
\begin{tikzpicture}

\begin{semilogyaxis}
[xlabel=Index,ylabel=Value,
title=Value vs. Index]

\addplot[color=blue,mark=*]
coordinates {
(1,8)
(2,16)
(3,32)
(4,64)
(5,128)
(6,256)
(7,512)
};
\end{semilogyaxis}
\end{tikzpicture}
```

Bar plots

Plot

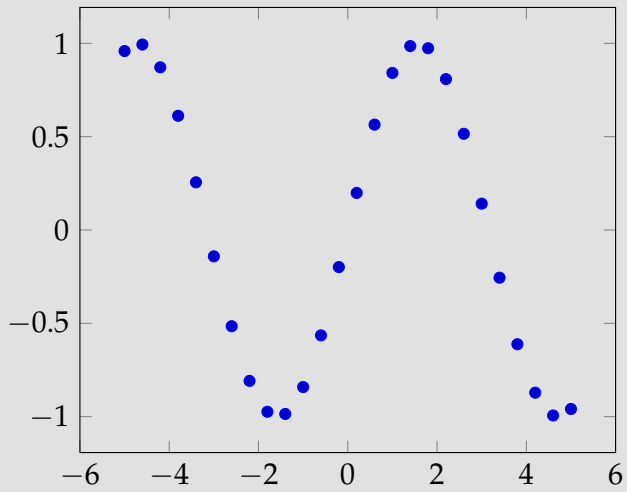


Code

```
\begin{tikzpicture}
\begin{axis}

\addplot+[ybar] plot coordinates

{(0,3) (1,2) (2,4) (3,1) (4,2)};
\end{axis}
\end{tikzpicture}
```

Axis limits (domain)

Plot

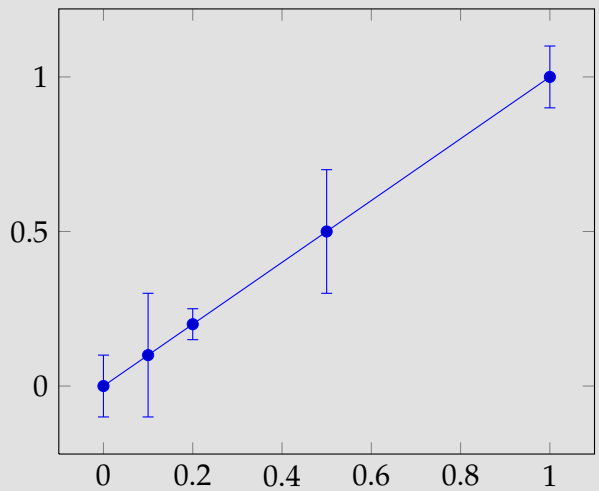


Code

```
\begin{tikzpicture}
\begin{axis}

\addplot+[only marks,domain=-pi:pi]

{sin(deg(x))};
\end{axis}
\end{tikzpicture}
```

Error bars

Plot

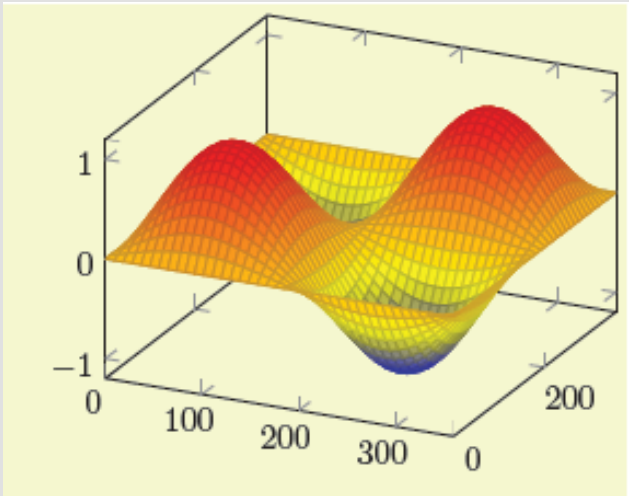


Code

```
\begin{tikzpicture}
\begin{axis}

\addplot plot[error bars/.cd,
y dir=both(plus/minus), y explicit]

coordinates{
(0,0) +- (0.5,0.1)
(0.1,0.1) +- (0.05,0.2)
(0.2,0.2) +- (0,0.05)
(0.5,0.5) +- (0.1,0.2)
(1,1) +- (0.3,0.1)
};
\end{axis}
\end{tikzpicture}
```

3D plots

Plot



Code

```
\begin{tikzpicture}
\begin{axis}

\addplot3[surf,domain=0:360,samples=40]

{sin(x)*sin(y)};
\end{axis}
\end{tikzpicture}
```

Thank You