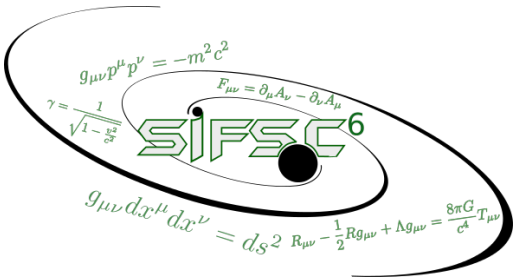
Desenhando com LaTeX

uma breve introdução aos pacotes TikZ e PGFplots

Krissia de Zawadzki

Instituto de Física de São Carlos - Universidade de São Paulo



05 de Outubro de 2016

Sumário

1. Introdução
2. Formas básicas
3. Diagramas e decorações
4. Plots e gráficos
5. Desenhos aleatoriamente legais

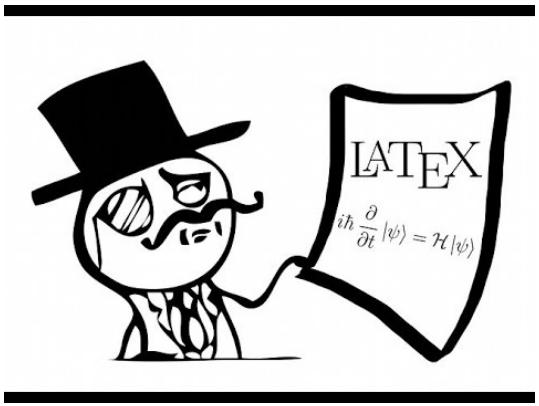
LaTeX

- ✓ sistema de edição/formatação de documentos de alta qualidade
- ✓ amplamente usado para artigos científicos

LaTeX

{TEX}

- ✓ sistema de edição/formatação de documentos de alta qualidade
- ✓ amplamente usado para artigos científicos
- ✓ amado por físicos



PRL 116, 061102 (2016) Selected for a Viewpoint in *Physics* PHYSICAL REVIEW LETTERS week ending 12 FEBRUARY 2016

Observation of Gravitational Waves from a Binary Black Hole Merger

B. P. Abbott *et al.*
(LIGO Scientific Collaboration and Virgo Collaboration)
(Received 21 January 2016; published 11 February 2016)

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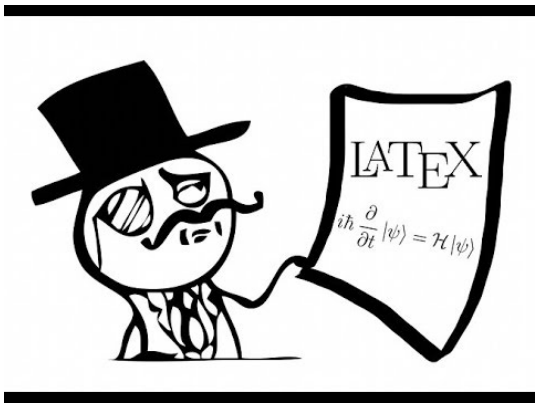

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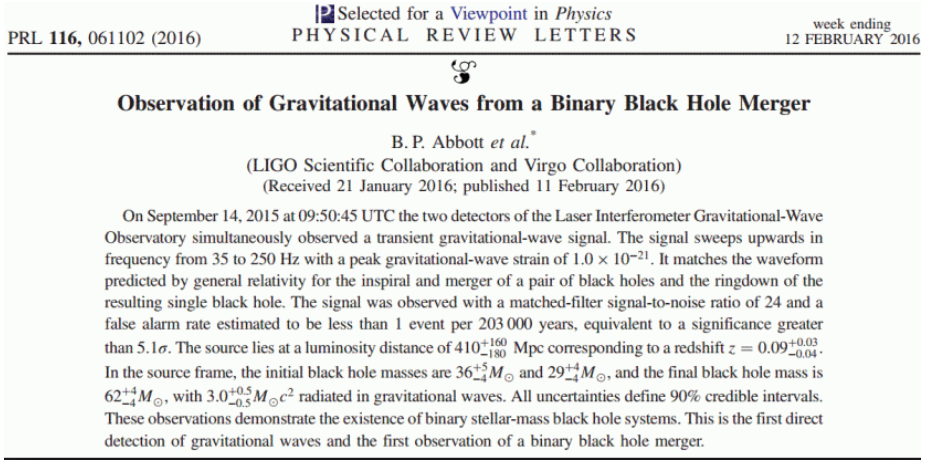

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✗ sintaxe complicada/user-friendly

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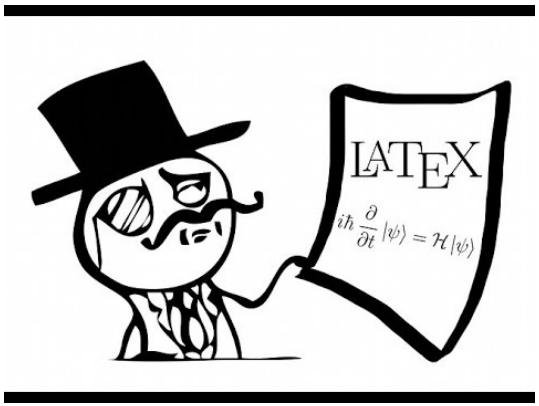

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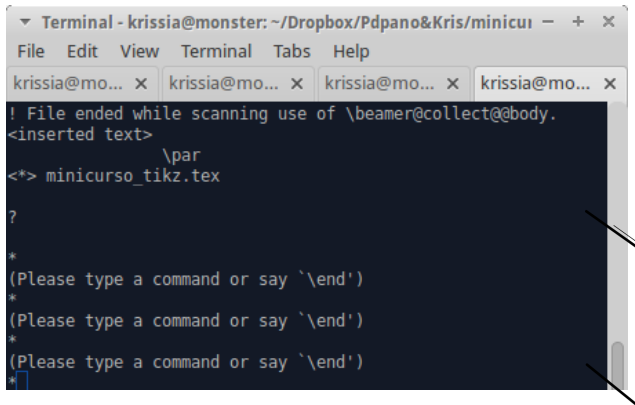
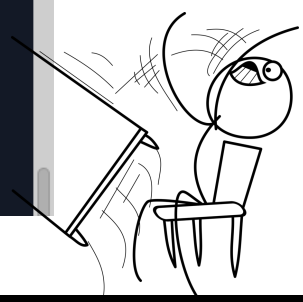


✗ sintaxe complicada/user-friendly

✗ odiado por estudantes sujeitos às regras ABNT



TikZ e PGF

- ✓ formas pré-definidas
- ✓ suporte para desenhos 2D, 3D
- ✓ combinam recursos TeX para gráficos de alta qualidade
- ✓ sintaxe intuitiva
- ✓ documentação recheada de exemplos

TikZ e PGF

{TikZ}
PGFplots

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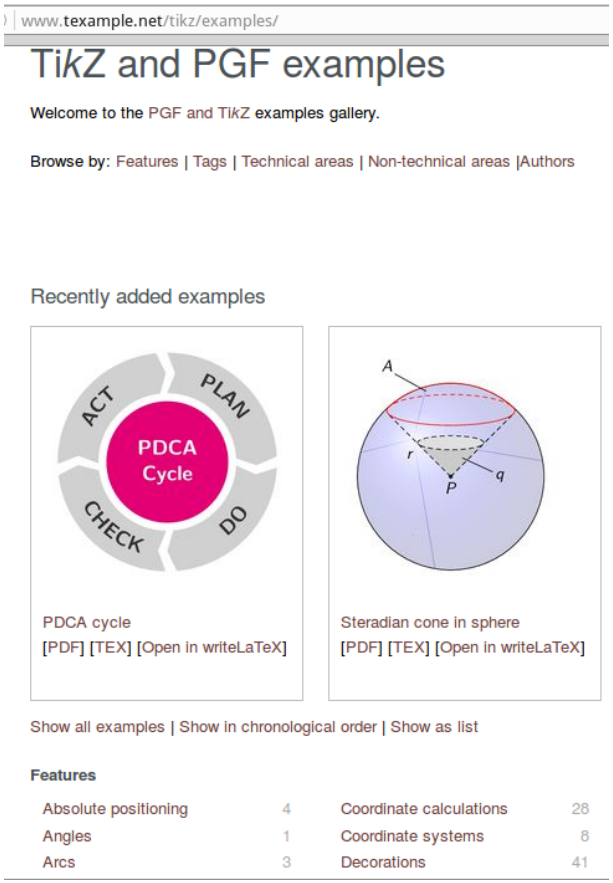

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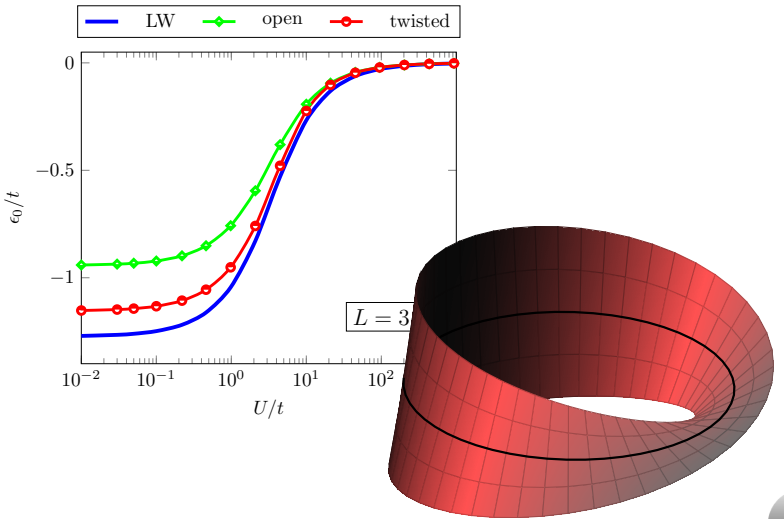
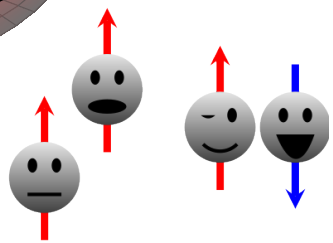


- ✓ e coisas aleatórias



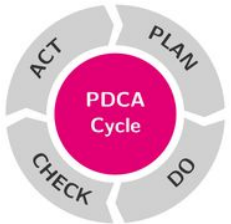
www.texample.net/tikz/examples/

TikZ and PGF examples

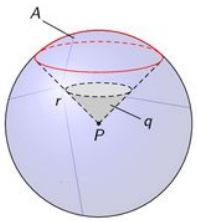
Welcome to the PGF and TikZ examples gallery.

Browse by: Features | Tags | Technical areas | Non-technical areas |Authors

Recently added examples



PDCA cycle
[PDF] [TEX] [Open in writeLaTeX]



Steradian cone in sphere
[PDF] [TEX] [Open in writeLaTeX]

Show all examples | Show in chronological order | Show as list

Features

Absolute positioning	4	Coordinate calculations	28
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Arcs	3	Decorations	41

Quick start

✓ conexão LaTeX: header e environments

✓ compilação: pdflatex

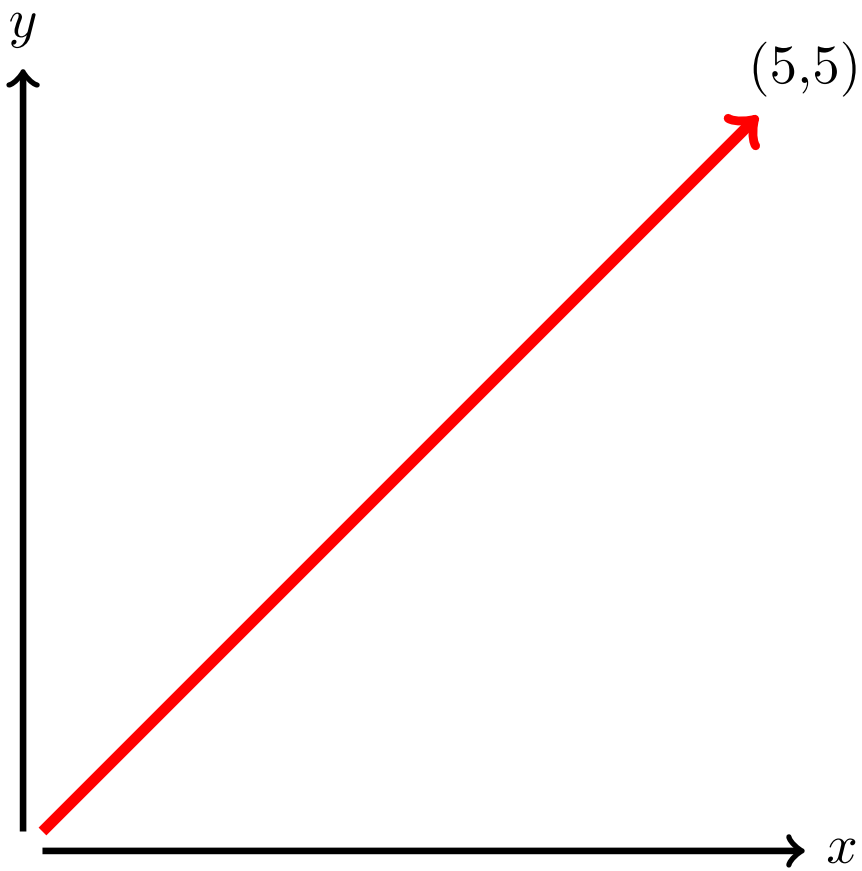
tty: /bin/bash

```
krissia@monster: $ vim desenhoTikZ.tex
\documentclass{standalone}
\usepackage{tikz}
```

```
\documentclass[]{standalone}

\usepackage{tikz}

\begin{document}

  \begin{tikzpicture}

  \end{tikzpicture}

\end{document}
```

Sistema de Coordenadas

✓ orientação cartesiana



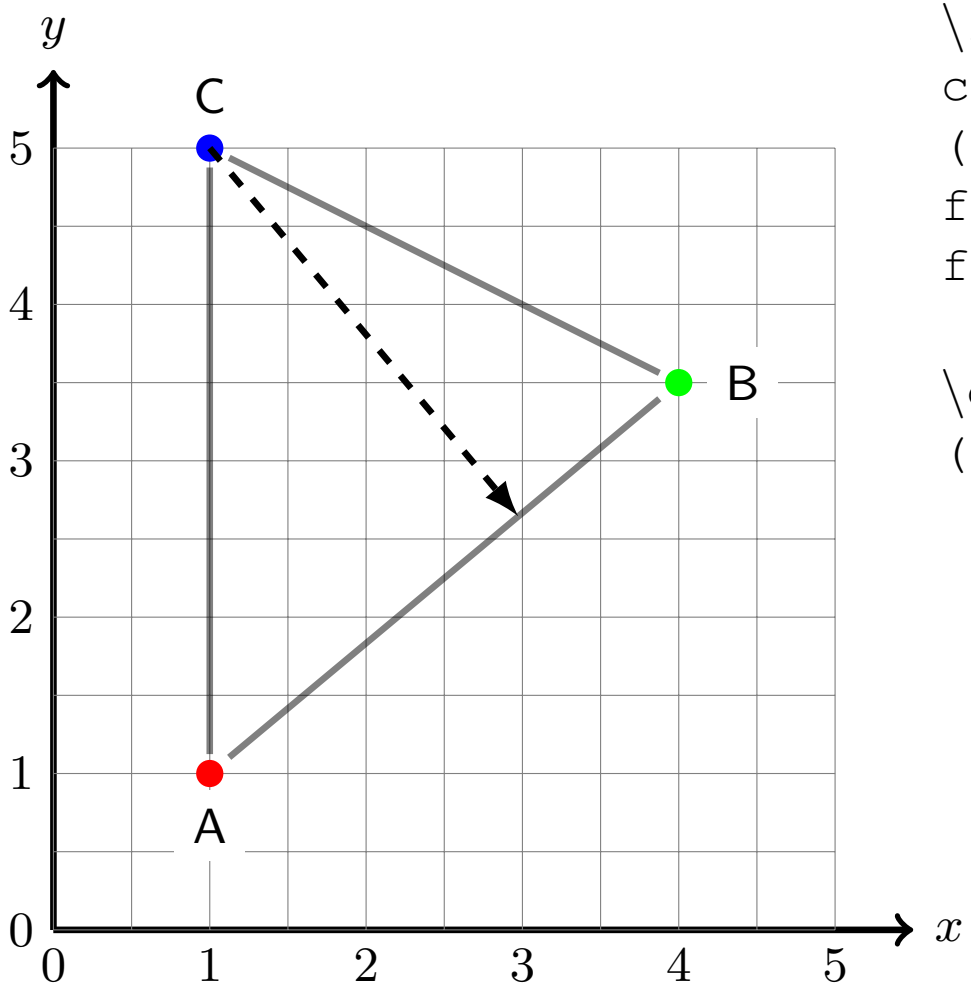
✓ desenhos no sistema de coordenadas

```
\draw[keywords set]
(origem)--(fim) { texto };
```

```
line width
color
dashed
bend
rotate
text options
```

Coordenadas 2-D

- orientação cartesiana



- pontos e retas no plano

```
\filldraw[cor] (x,y)
circle (0.08cm) node
(nomeno) node[anchor=north,
fill=cor,yshift=ys cm, text=cor,
font=familia ] {rotulo};

\draw[keywords] (coordbeg) --
(coordfim);
```

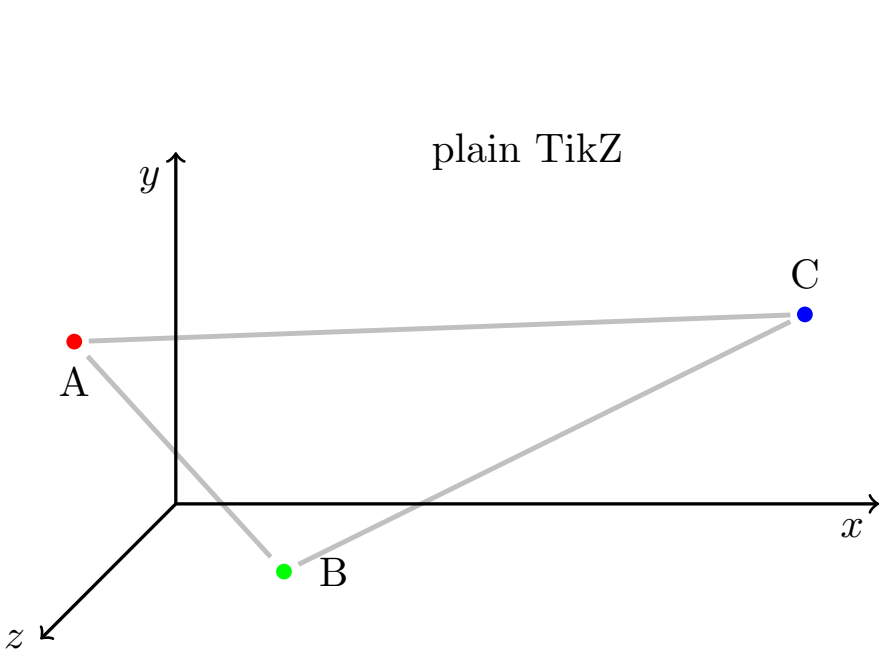
Coordenadas 3-D

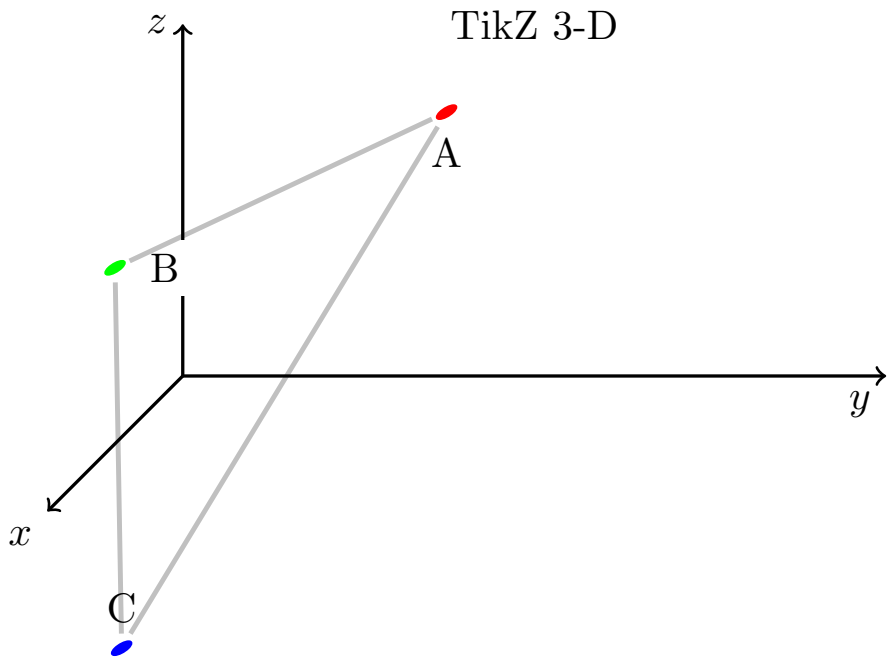
✓ orientação TikZ

x : (1,0,0)
y : (0,1,0)
z : (0,0,1) → profundidade

✓ orientação tikz-3dplot

x : (1,0,0) → profundidade
y : (0,1,0) → x-2D
z : (0,0,1) → y-2D



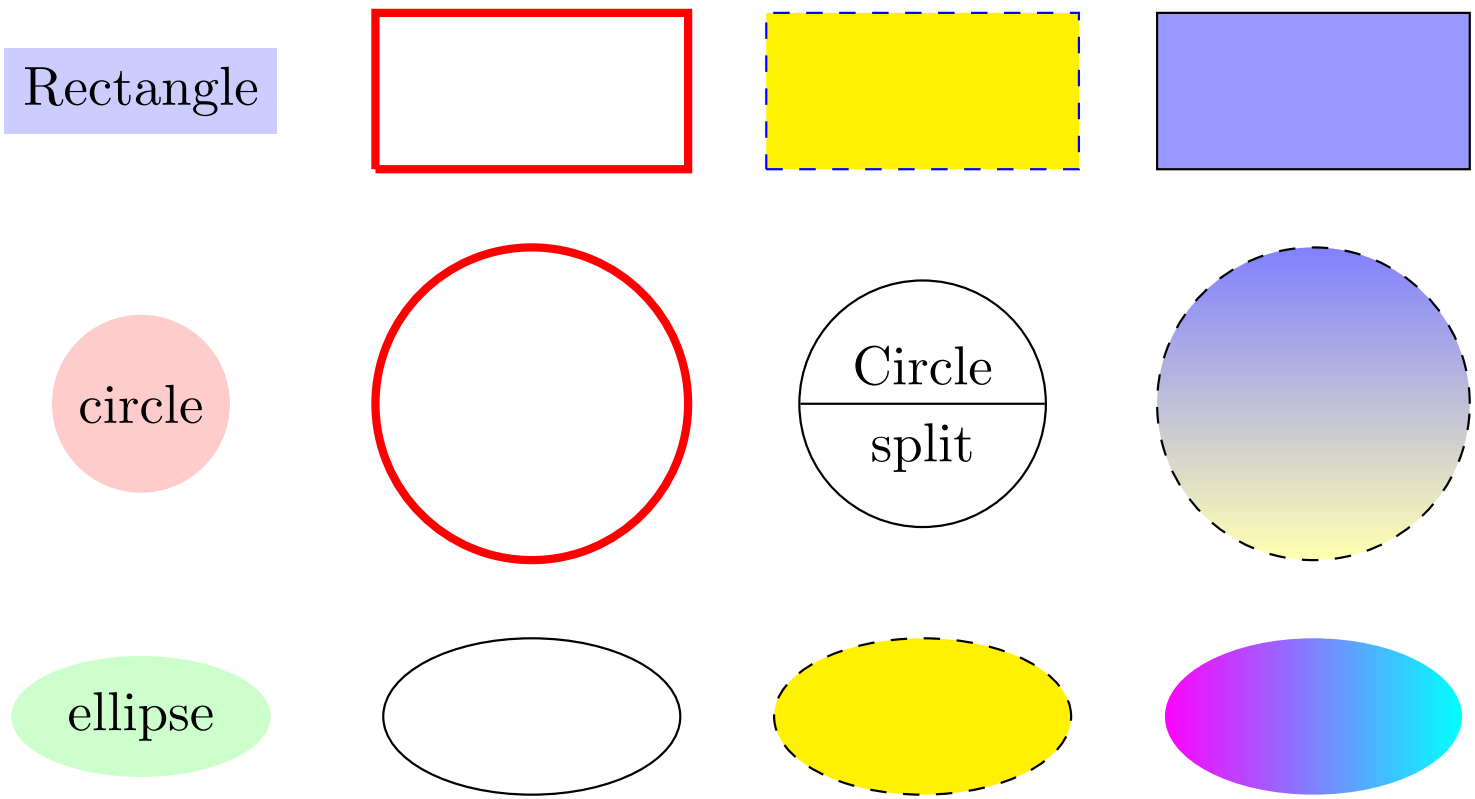


Formas básicas

✓ várias formas pré-implementadas: polígonos, cônicas, setas, estrelas

```
\usetikzlibrary{shapes}
```

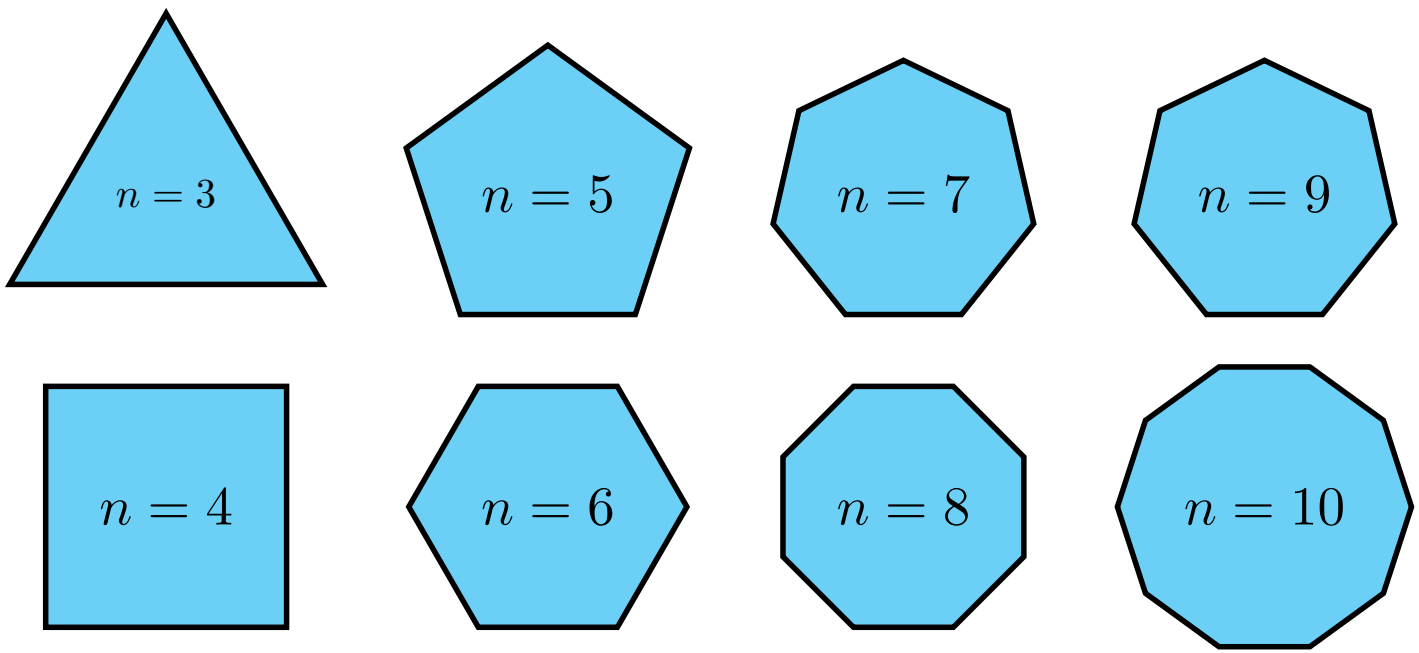
✓ mesma forma pode ser desenhada de várias maneiras



Polígonos regulares

- polígonos regulares

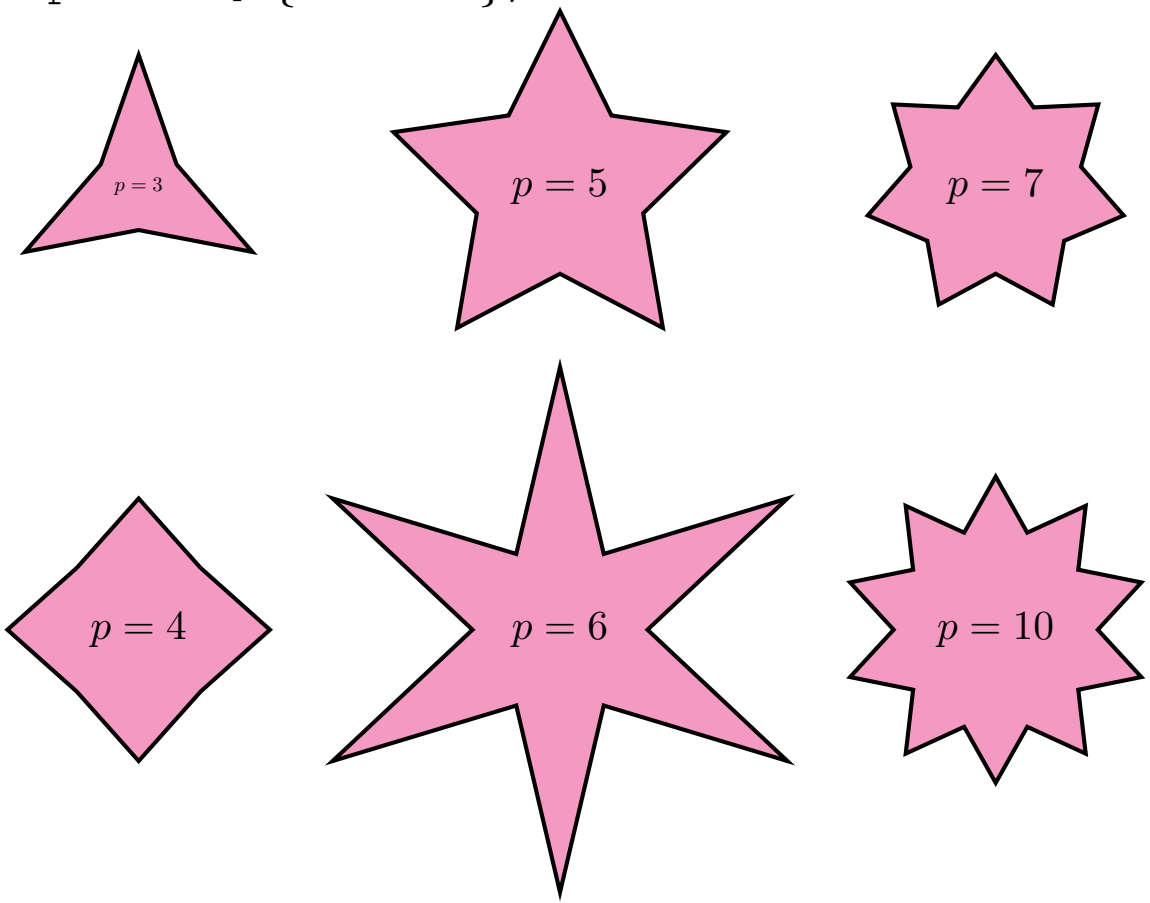
```
\node[regular polygon, regular polygon sides=numero de lados,
keywords] texto;
```



Estrelas

- estrelas

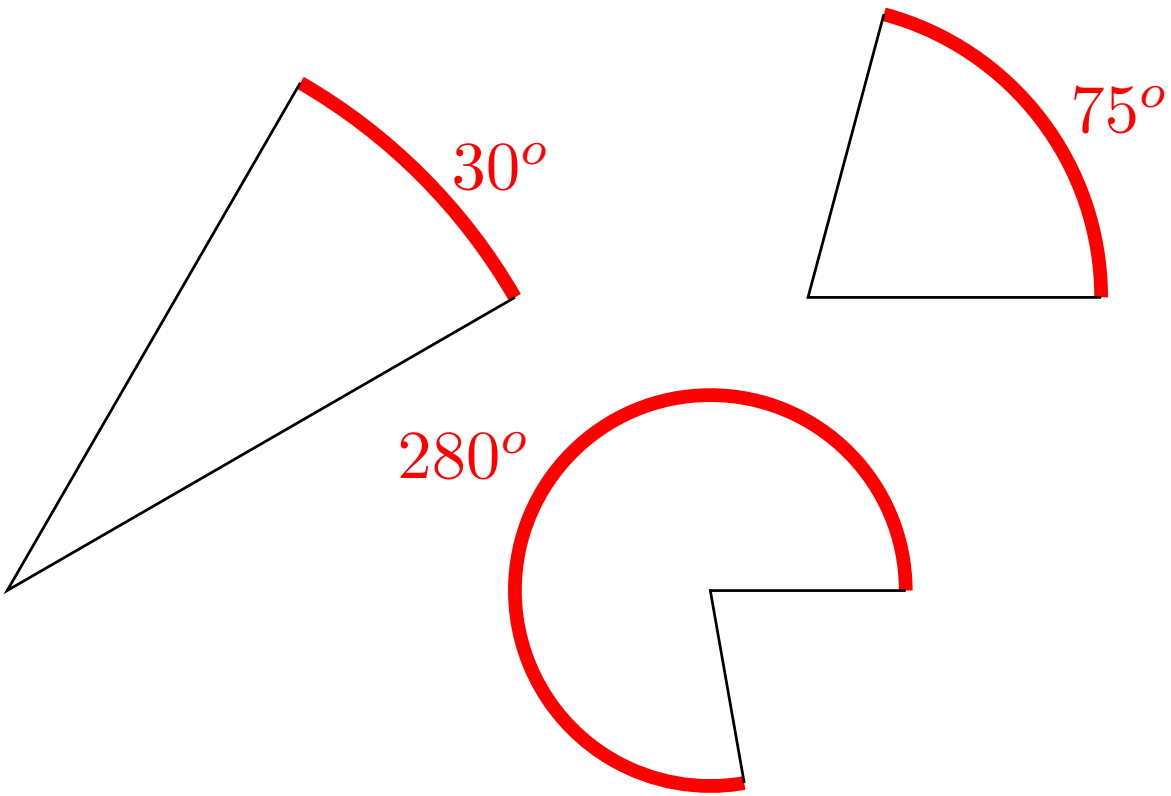
```
\node[star,star points=numero de pontas, star point ratio=escala das pontas] { texto };
```



Arcos de circunferência

- arcos são bastante versáteis

```
\draw[opcoes desenho] (coord) arc (\startangle:\endangle:\raio)
node [opcoes texto] { texto };
```



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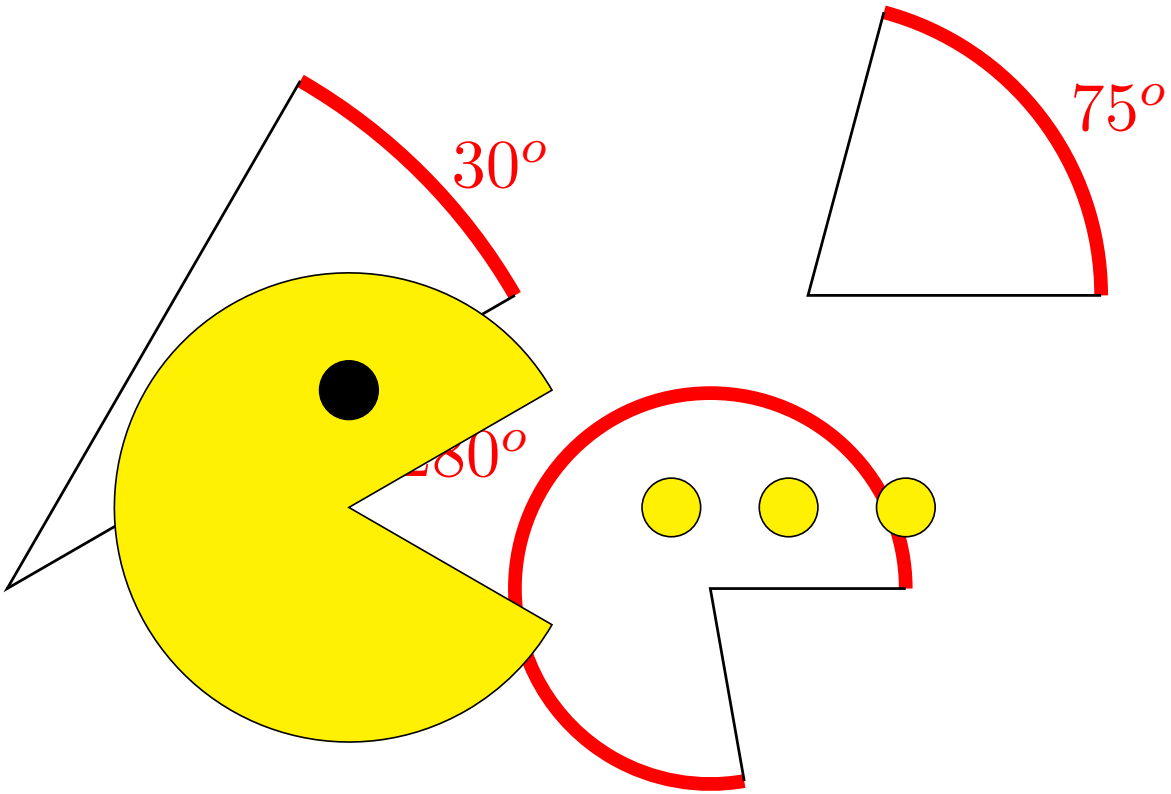

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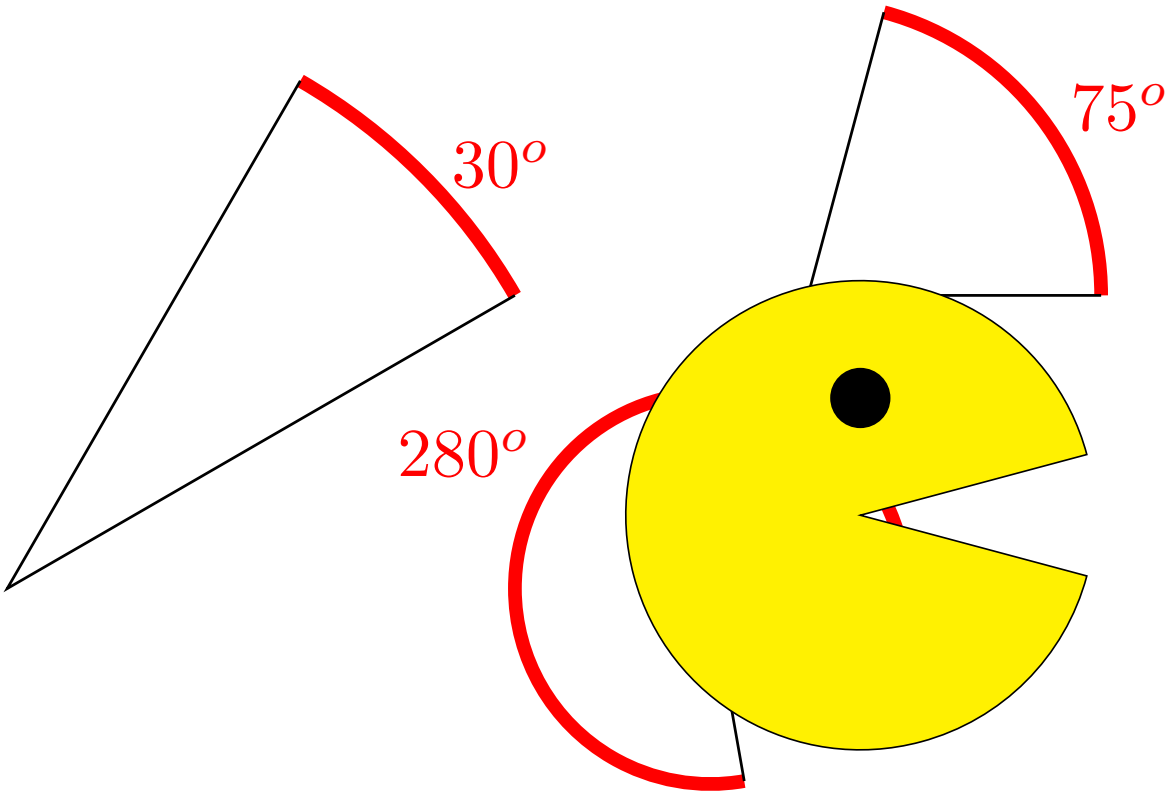

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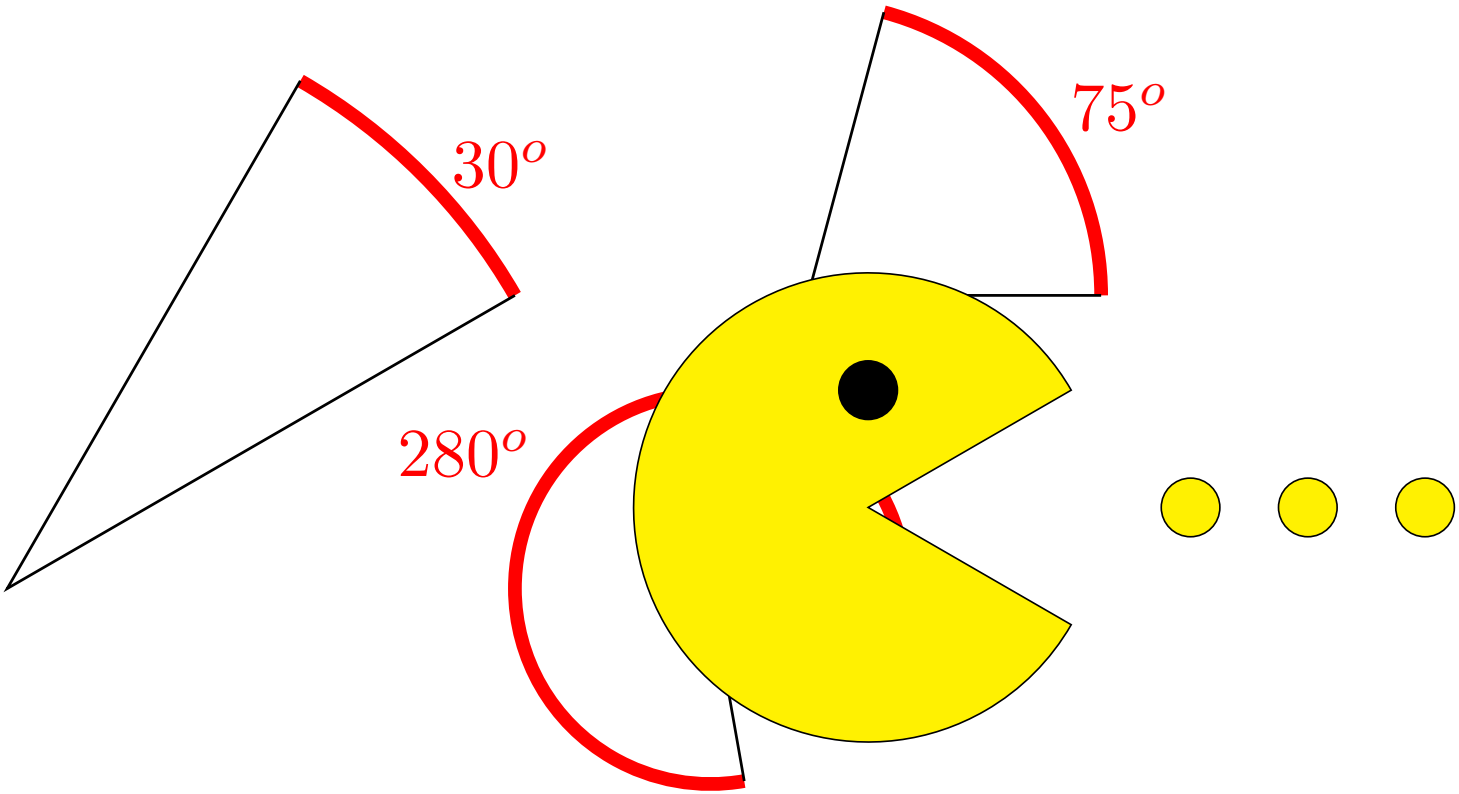

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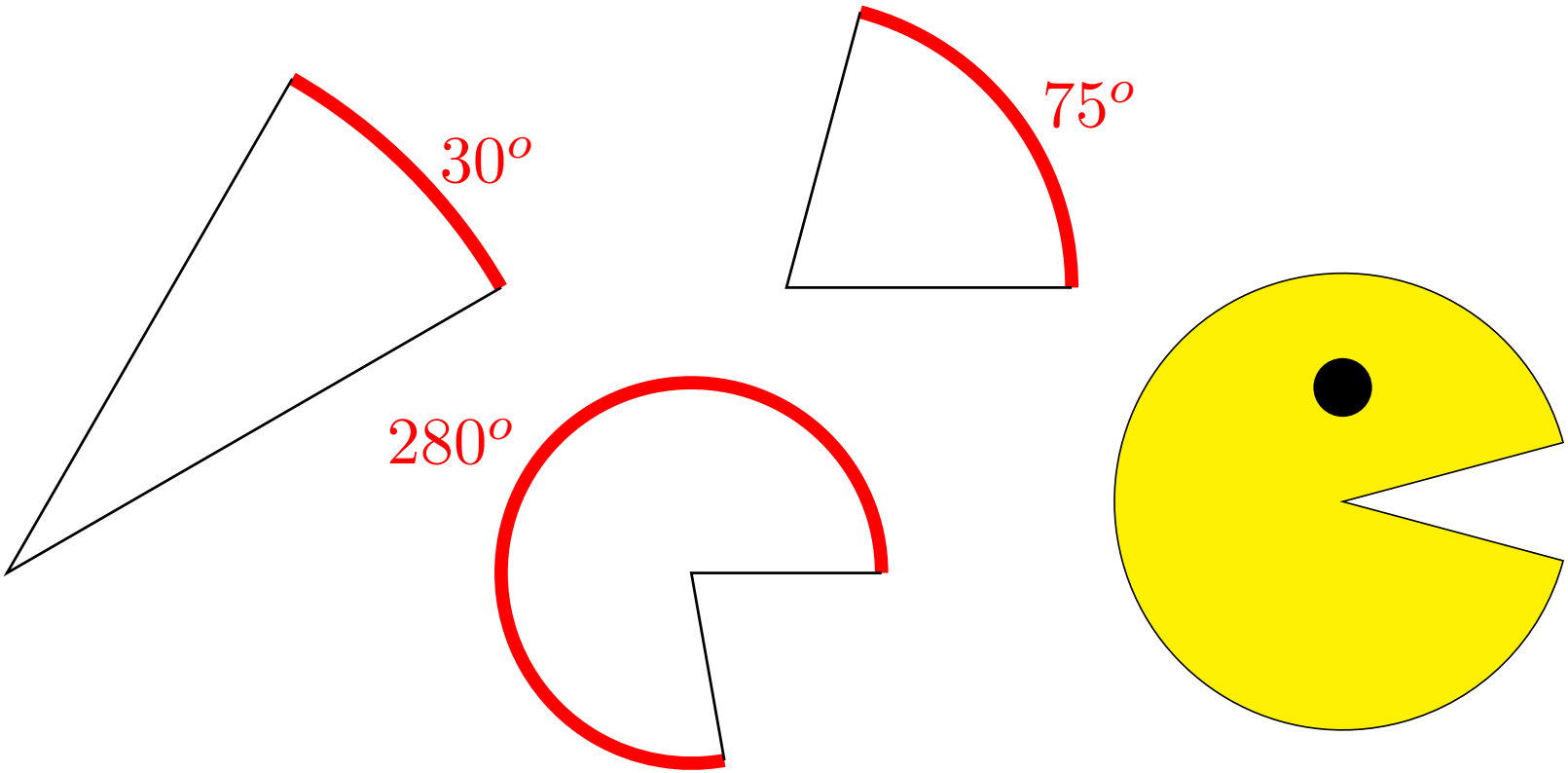
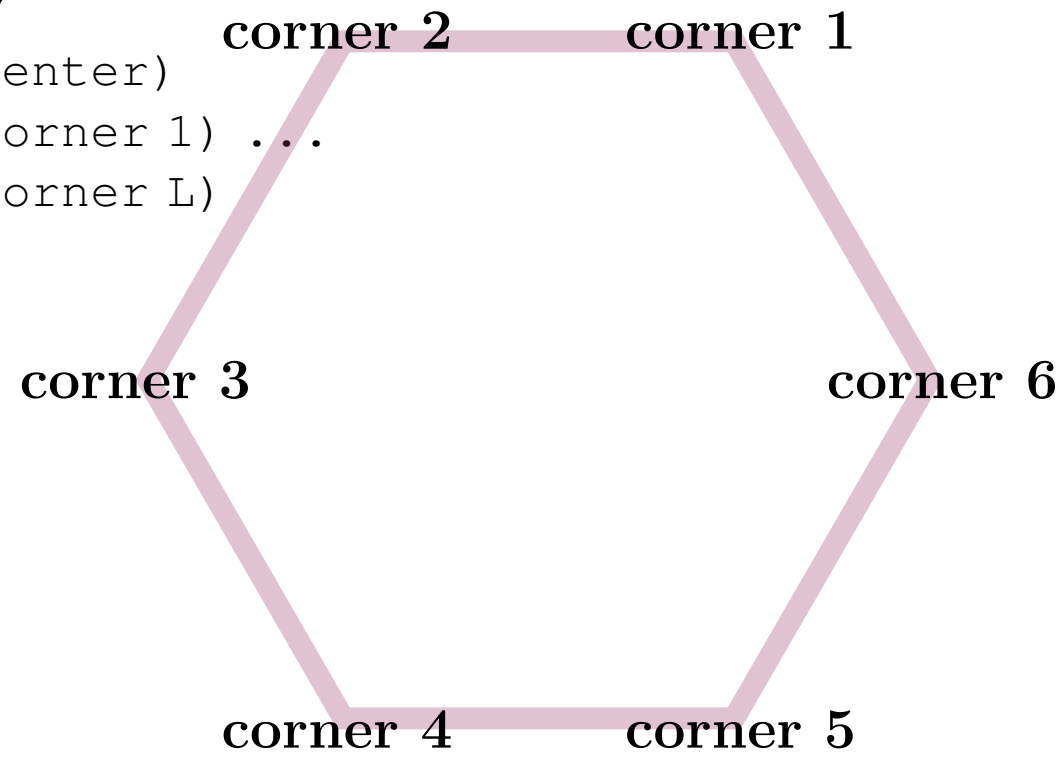


Vértices de polígonos e coordenadas

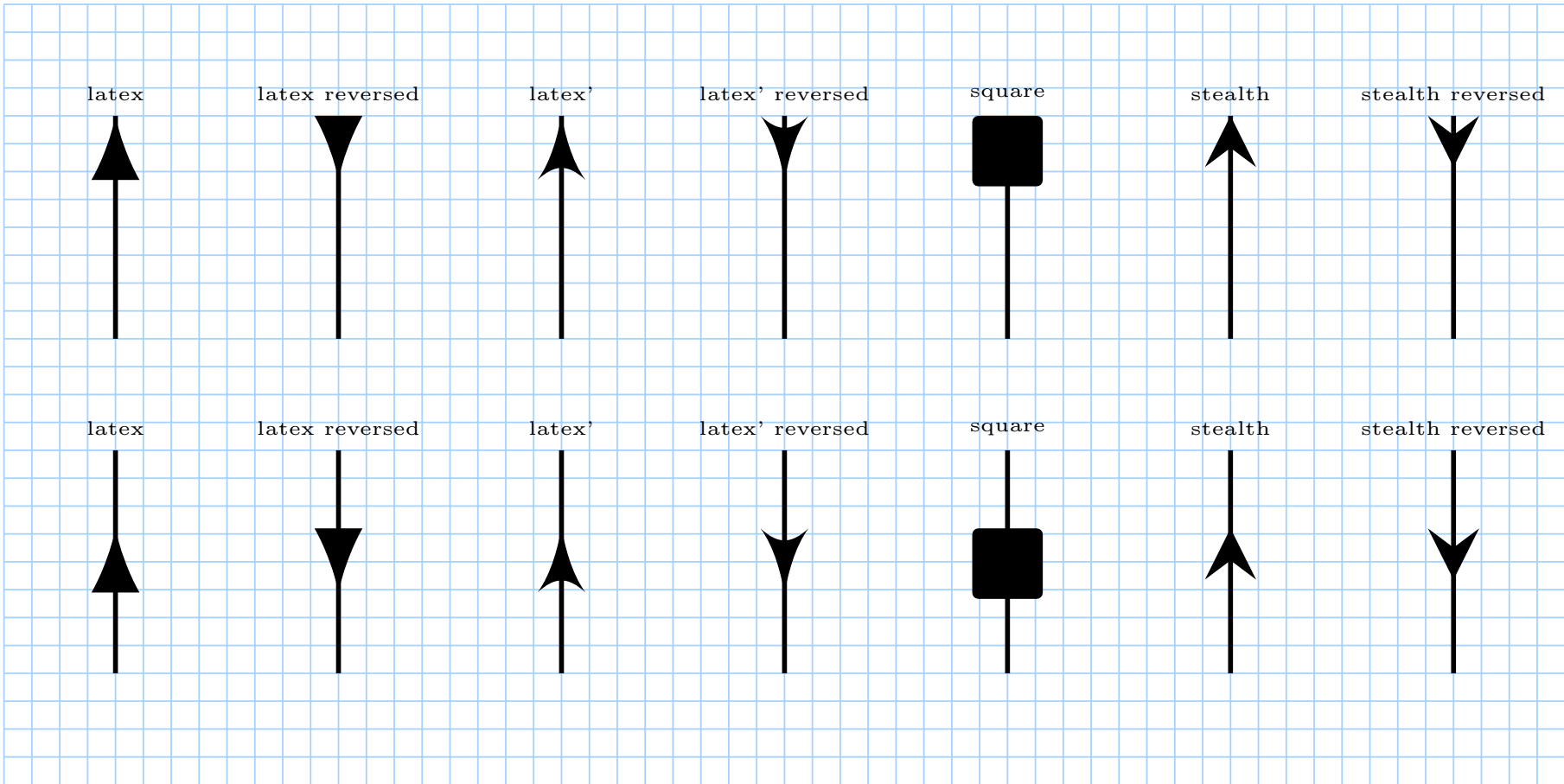
✓ é possível acessar as coordenadas relativas de vértices

```
\node[regular polygon, regular polygon sides=L] at (coordenada)
(polygonnode) ;
(polygonnode.center)
(polygonnode.corner 1) ...
(polygonnode.corner L)
```



Setas e Vetores

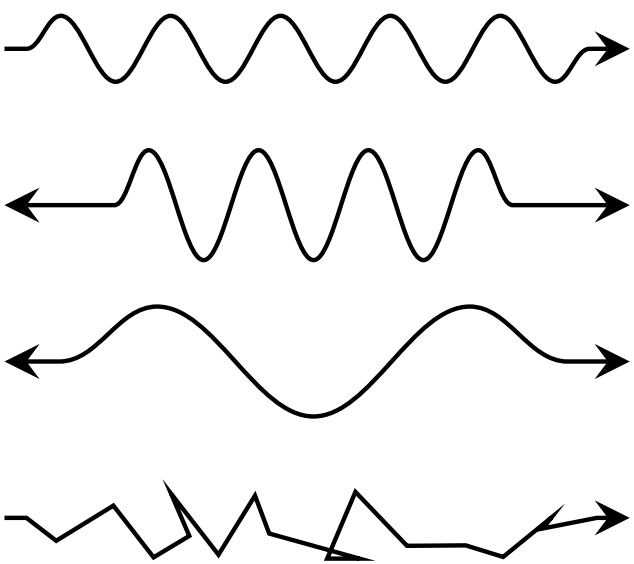
- ✓ vetores podem ser desenhados como nós ou retas com markers no fim
- ✓ diversos tipos de seta
- ✓ controle da posição da seta



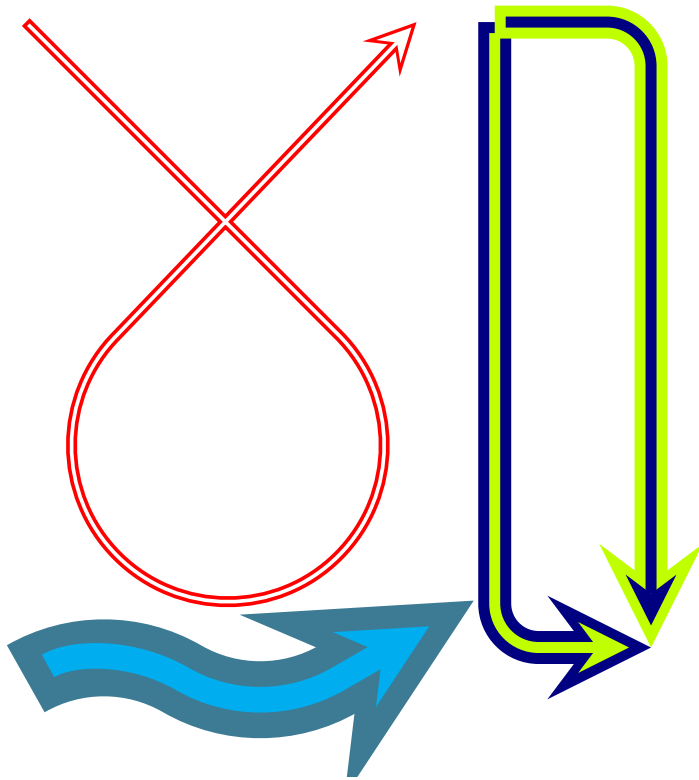
Setas e Vetores

- recursos de decoração

```
\usetikzlibrary{decorations}
\usetikzlibrary{decorations.pathmorphing}
```



- setas combinadas com curvas



TikZstyle

✓ estilo: definir uma forma recorrentemente usada

- específica na figura

```
\begin{tikzpicture}[
    meuestilo/.style={
    rectangle, draw=white,
    fill=black, very thick,
    inner sep=2mm,
    font=\ttfamily,
    text=white}
    ]

\end{tikzpicture}
```

✓ o código fica mais limpo

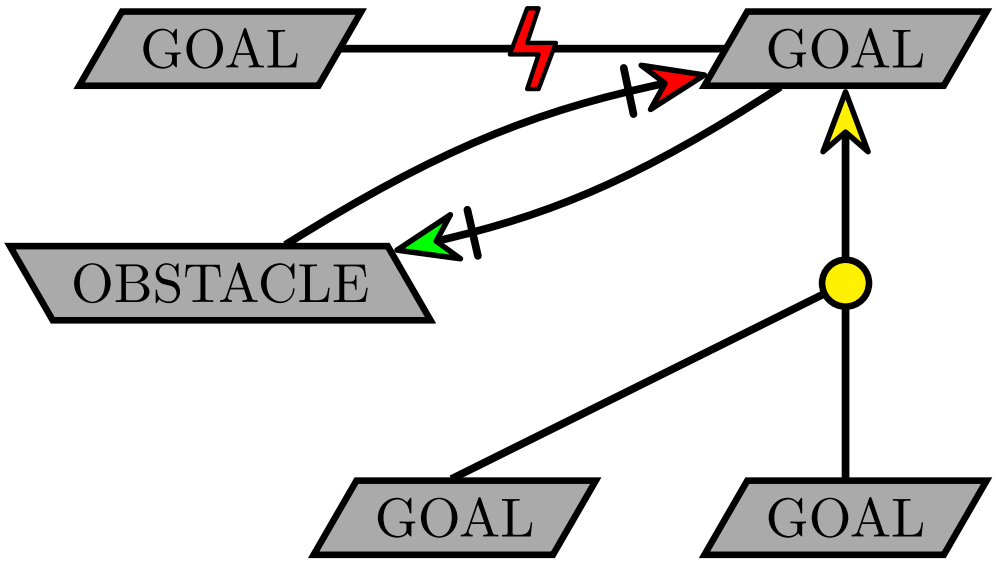
- global no documento

```
\tikzstyle meuestilo=[
    rectangle, draw=white,
    fill=black, very thick,
    inner sep=2mm,
    font=\ttfamily, text=white
    ]

  \begin{tikzpicture}

  \end{tikzpicture}
```

✓ conveniente para diagramas e figuras complicadas

Diagramas

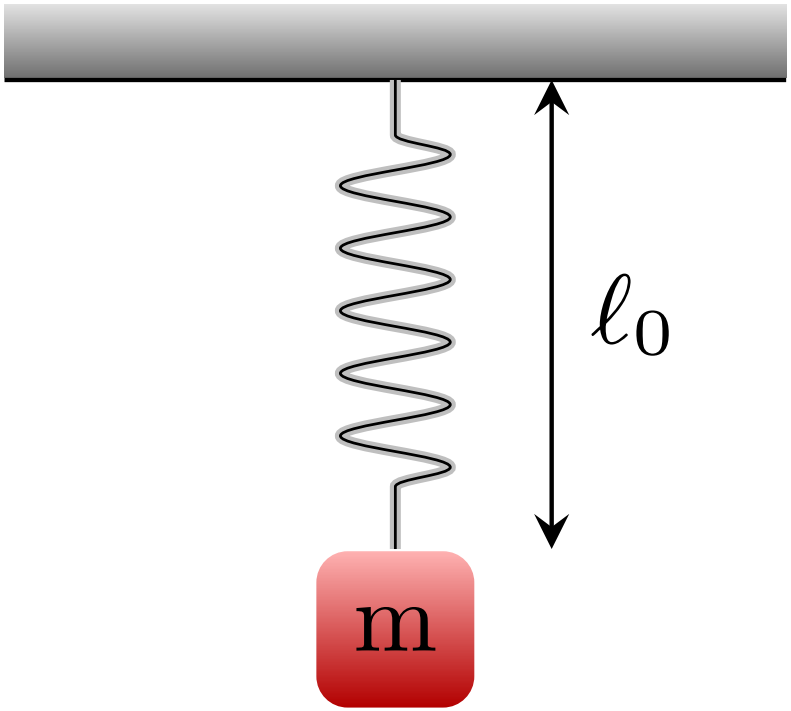
- ✓ coordenadas + tikzstyles + posições relativas
- ✓ diagramas ficam mais fáceis



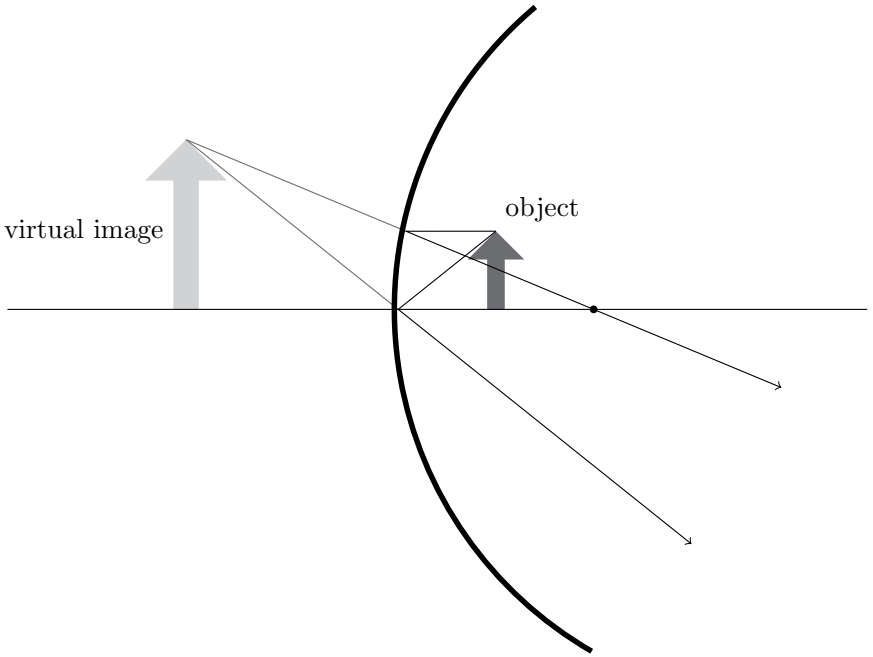

```
\usetikzlibrary{calc}
...
mynode/.style={opcoes}
...
anchor =
east, west, north, south
...
($ (nodename) + (x,y) $)
```

Diagramas e desenhos de Física

Ex: Sistema massa-mola

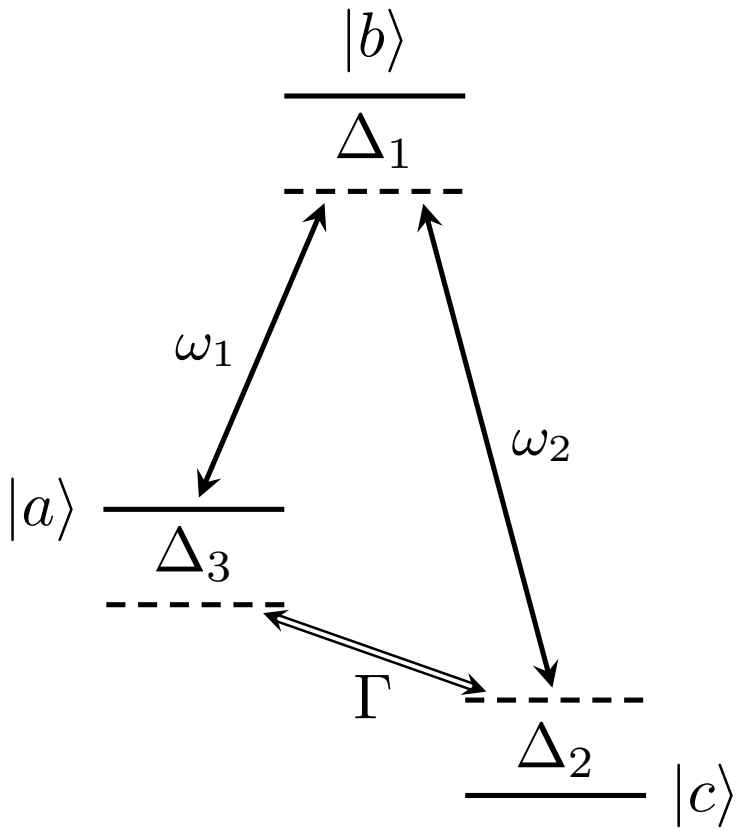


Ex: Óptica básica

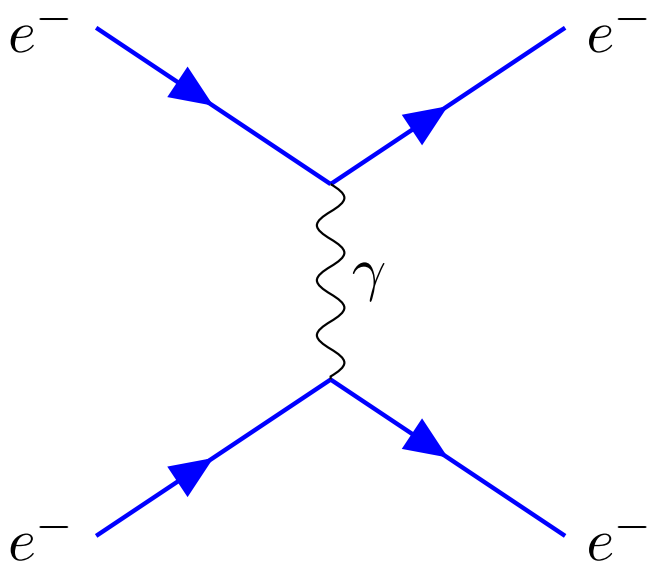


Diagramas e desenhos de Física

Ex: Níveis de energia

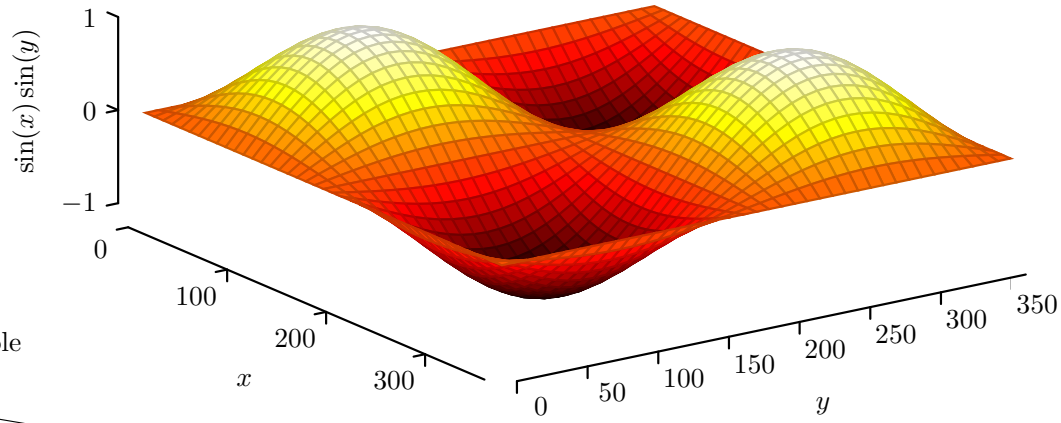


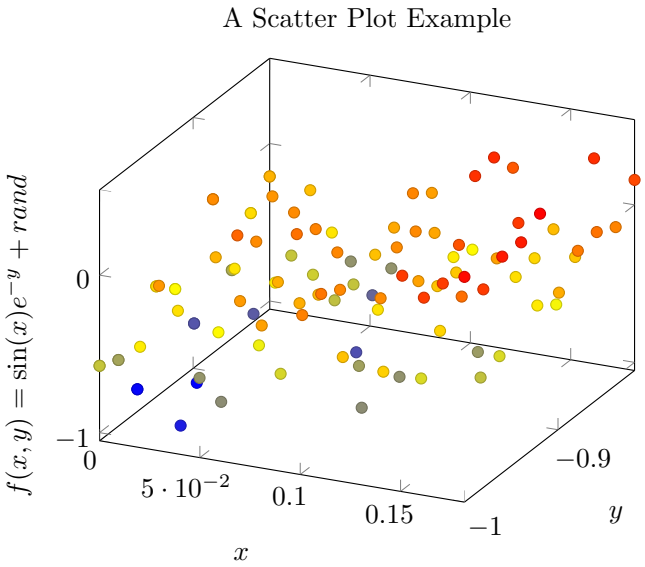
Ex: Diagramas de Feynman

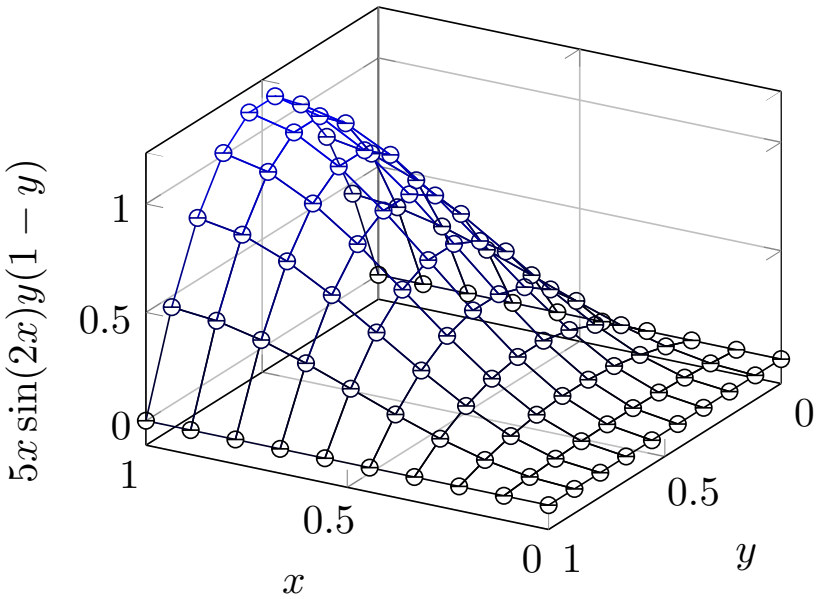


Plots e gráficos

✓ PGFplots oferece recursos para gráficos de excelente qualidade





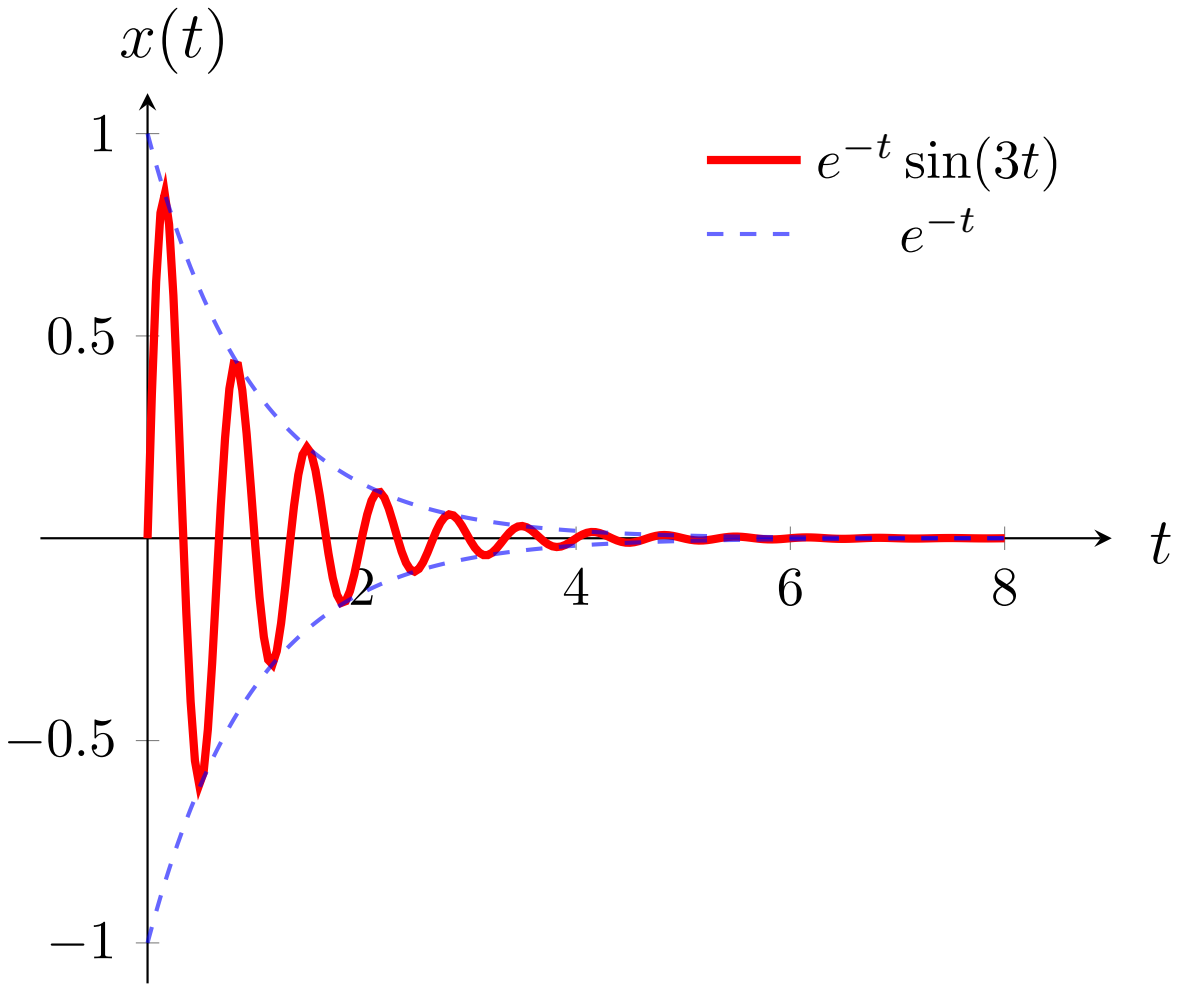


Gráficos de funções analíticas

```
\documentclass[]{standalone}
\usepackage{pgfplots}

\begin{document}

\begin{tikzpicture}
  \begin{axis}[options]

    \addplot[domain=\xmin:\xmax,
    samples=\npoints, args]
    {function};

    \legend{$ function$, };

  \end{axis}
  \end{tikzpicture}

\end{document}
```

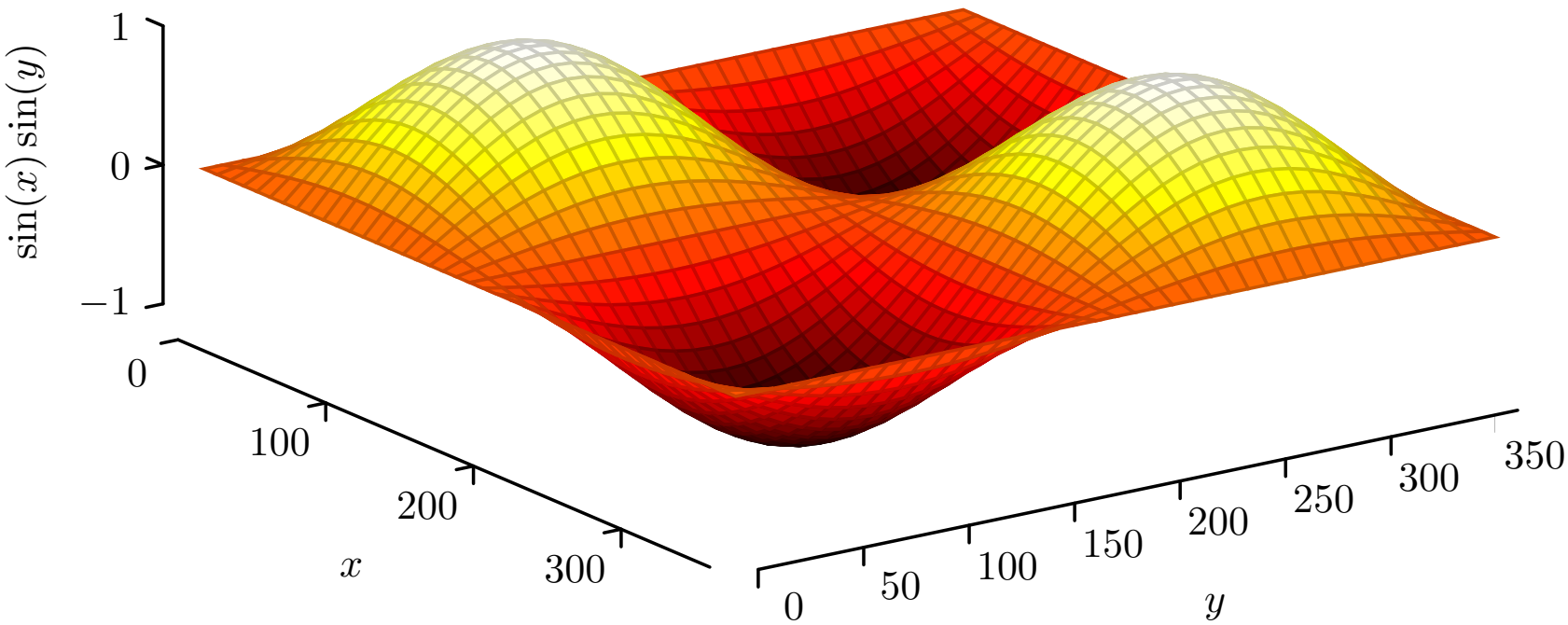
Gráficos de funções analíticas 2-D

- ✓ biblioteca matemática para cálculos



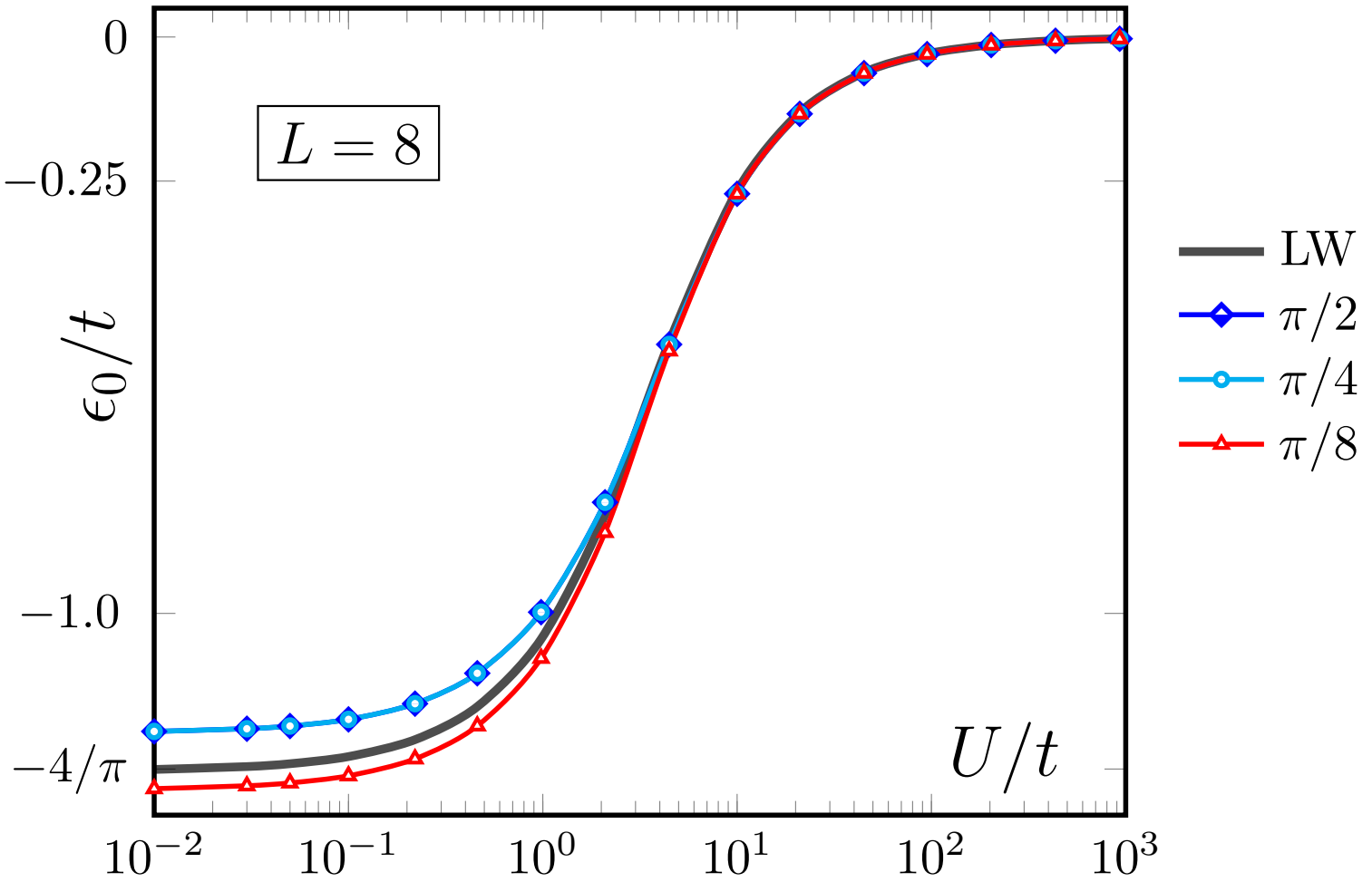
Gráficos de funções analíticas 3-D

✓ `\addplot3[args] { funcao };`



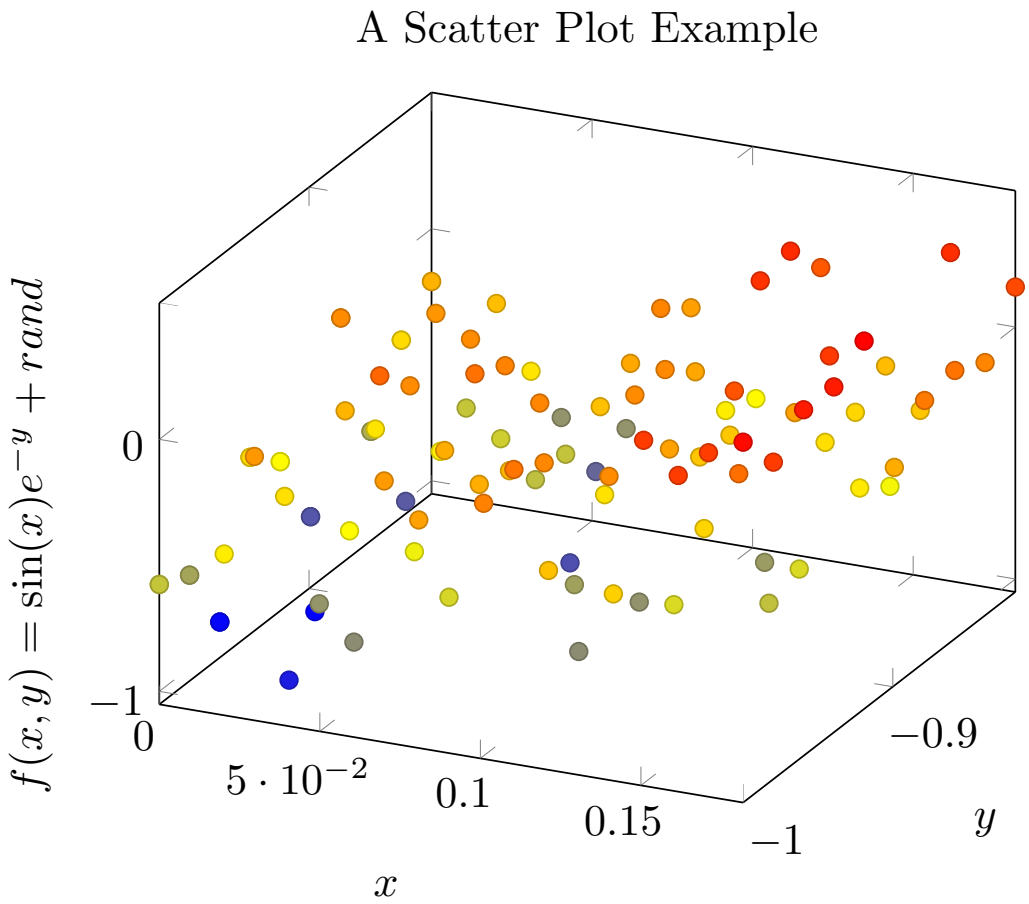
Plotando dados de arquivos externos

```
\addplot[args] table [x index = coluna x, y index= coluna y] {
arquivo.dat };
```



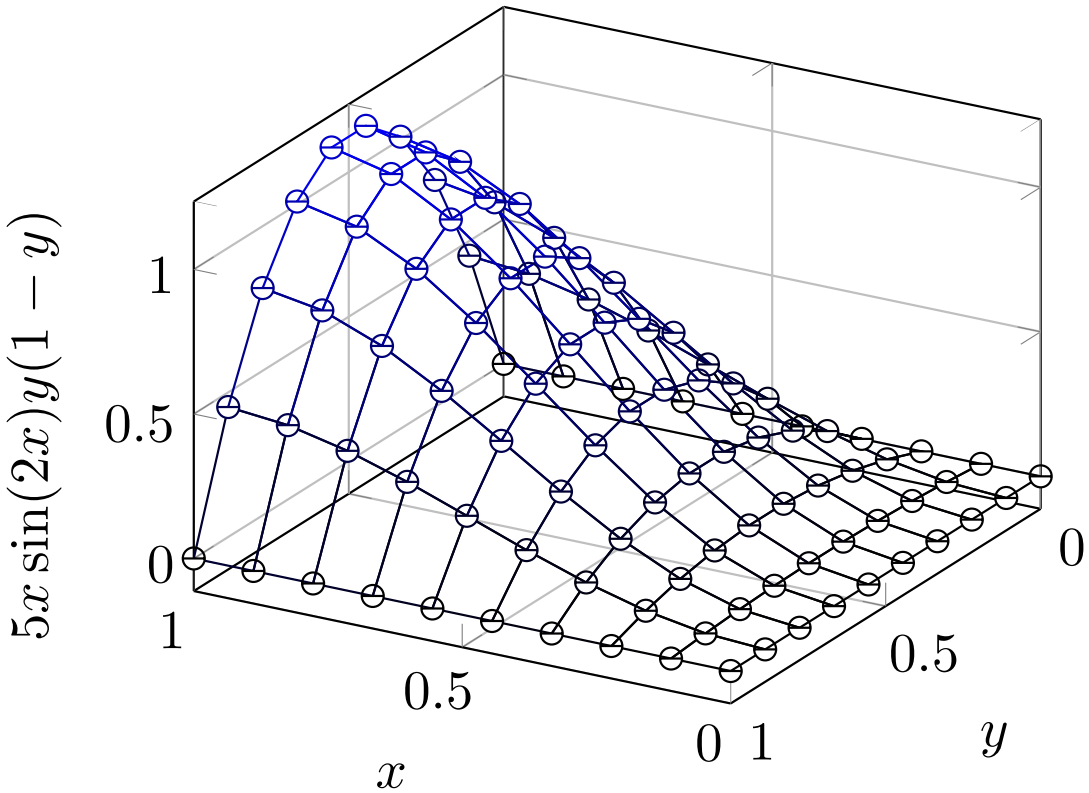
Scatter plots

✓ suporte para scatter plots



Mesh plots

✓ suporte para scatter plots

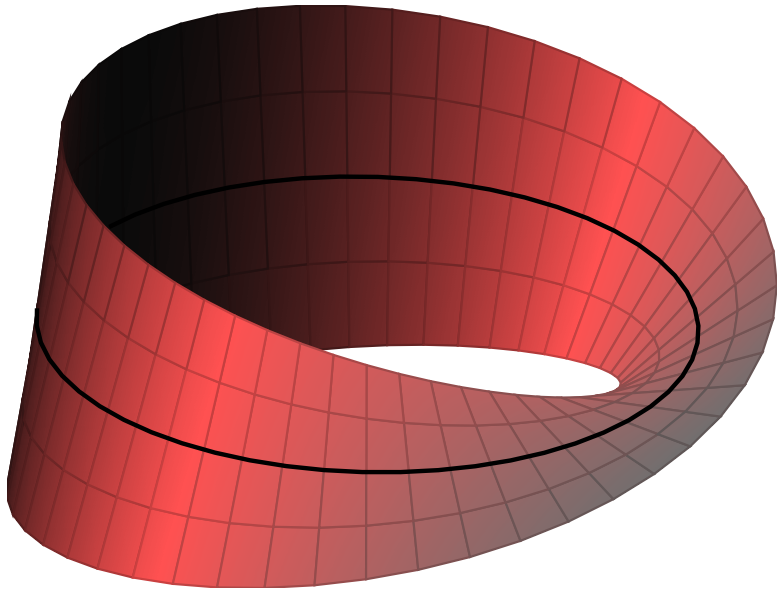


Customizações

✓ costumizações são possíveis ☠complicadas de implementar ...

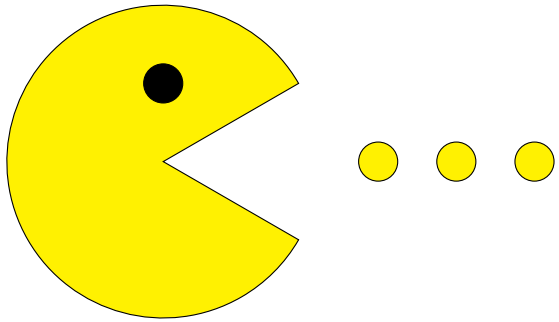
Ex: colormap vermelho em uma faixa de moebius

```
\pgfplotsset{ colormap={myred}rgb255(0cm)=(10,10,10);
rgb255(1cm)=(255,81,81); rgb255(2cm)=(111,111,111)}
```



Desenhos aleatoriamente legais

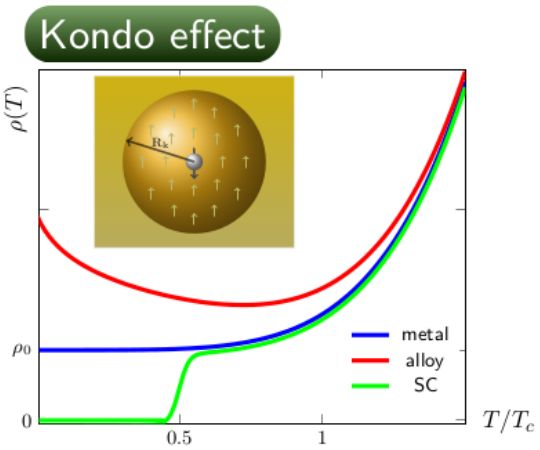
✓ muita coisa legal (e aleatória) pode ser desenhada!

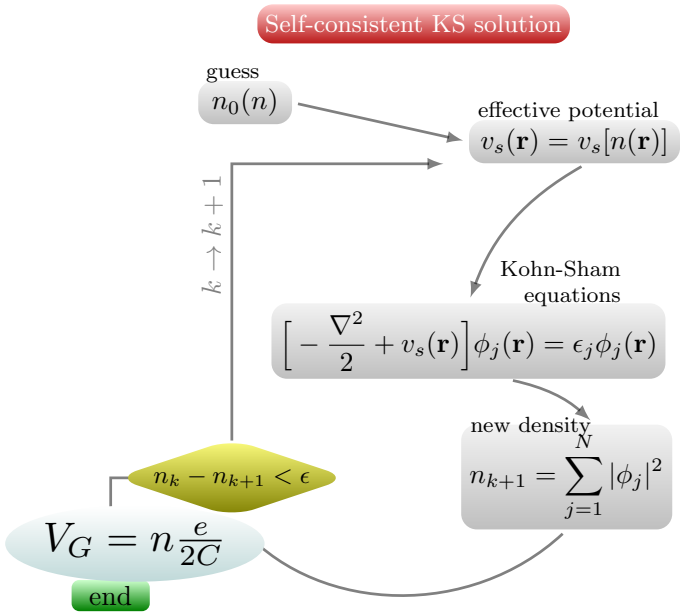


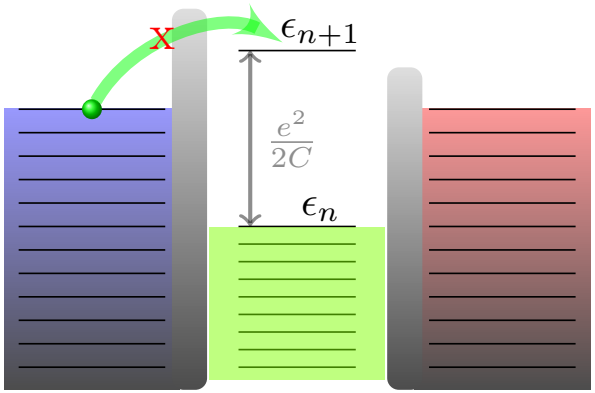
basic
sad
neutral
small smile
big smile
confused
sexy
look up
look down
angry
look left
look right
blush
LaTeX
Tikz
martian
devilish
almost crying

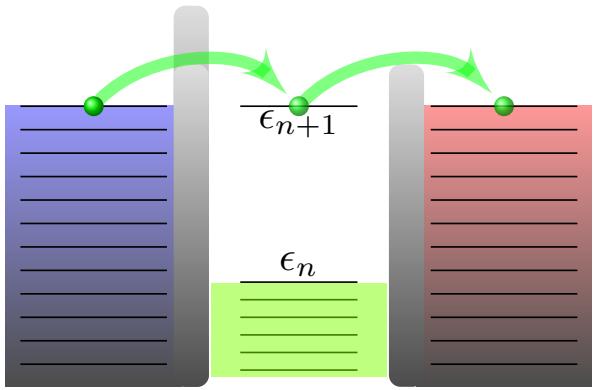
Desenhos aleatoriamente legais

✓ muita coisa legal (e aleatória) pode ser desenhada!



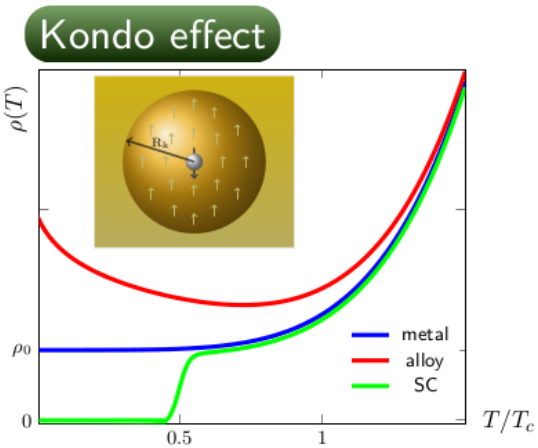


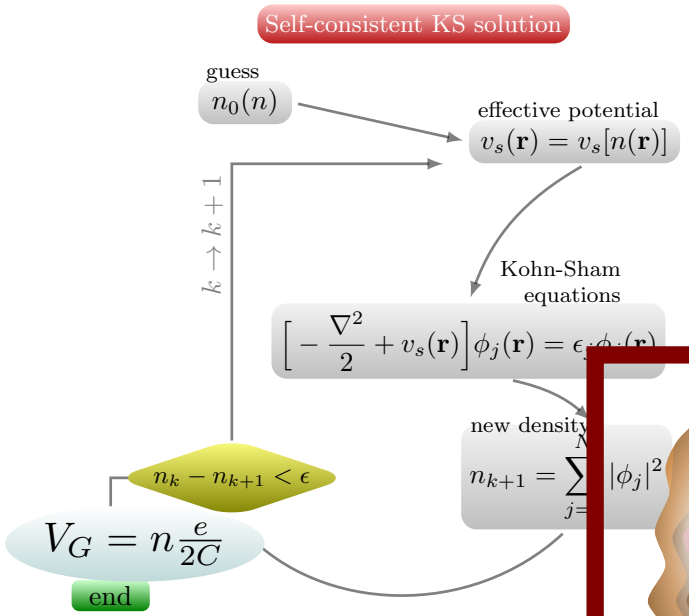


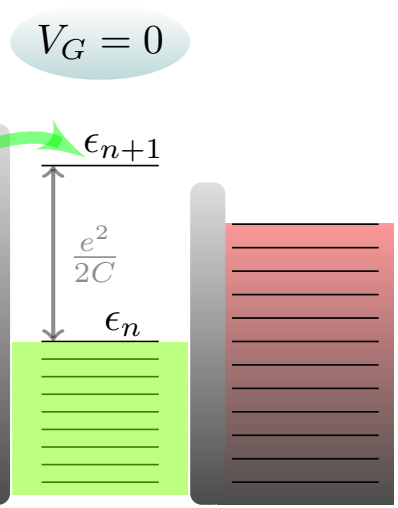


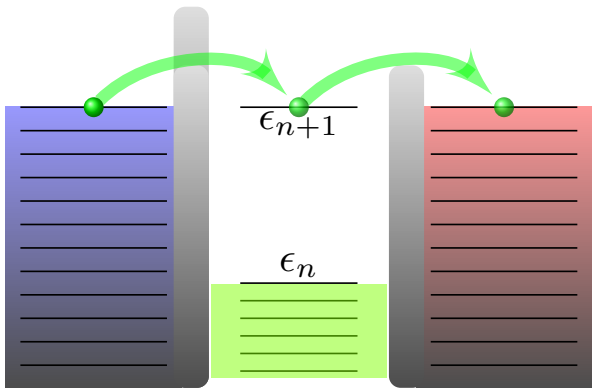
Desenhos aleatoriamente legais

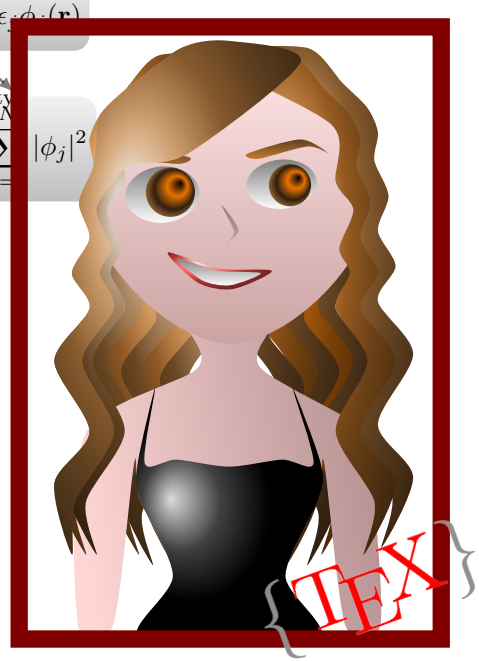
✓ muita coisa legal (e aleatória) pode ser desenhada!











Referências

Documentação completa

- http://www.texample.net/tikz/
- http://pgfplots.sourceforge.net/

Recomendados

- http://tex.stackexchange.com
- http://jgaa.info/getPaper?id=301
- http://www.inf.unibz.it/~ebotoeva/fancytikzposter.html

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