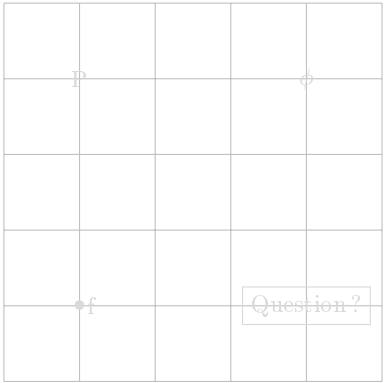
Présentation du package : TikZ

Juan Viu Sos

Benoît Guerville-Ballé

Les nœuds




```
\begin{tikzpicture}
  \node (P) at (0,0) {P};
  \node at (3,0) {$\phi$};
  \node (f) at (0,-3) {$\bullet$};
  \node[right] at (f) {f};
  \node[draw] (Q) at (3,-3) {Question ?};
\end{tikzpicture}
```

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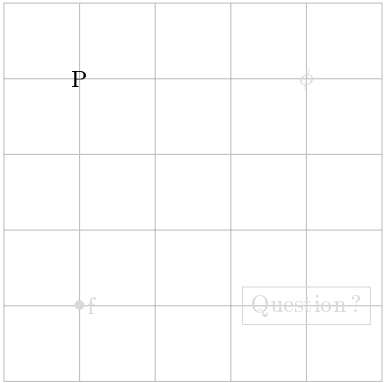


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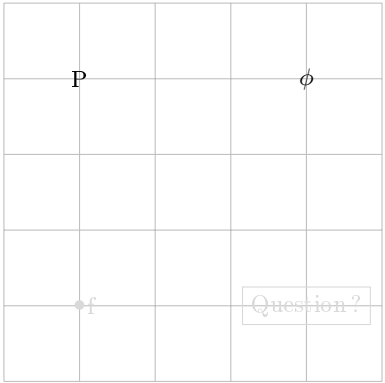


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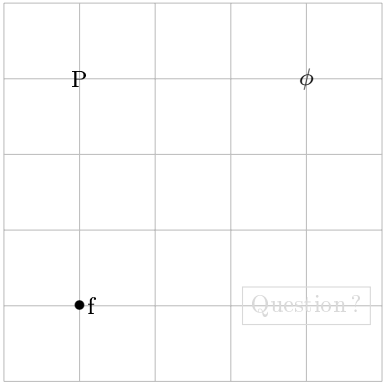


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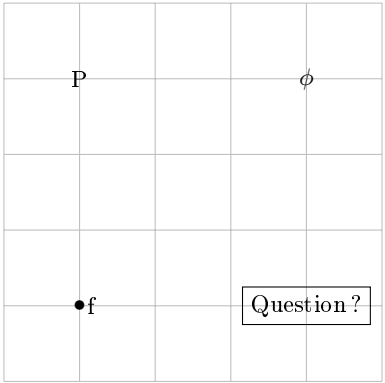


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\end{tikzpicture}
```

Tracer des traits


```
\begin{tikzpicture}
  \draw (0,0) -- (4,0);
  \node (A) at (0,-1) {A};
  \node (B) at (4,-1) {B};
  \draw[->] (A) -- (B);
  \draw[dotted] (0,-2) -- (2,-3) -- (4,-2);
  \draw[thick] (0,-4) to[out=90,in=-90] (4,-4);
\end{tikzpicture}
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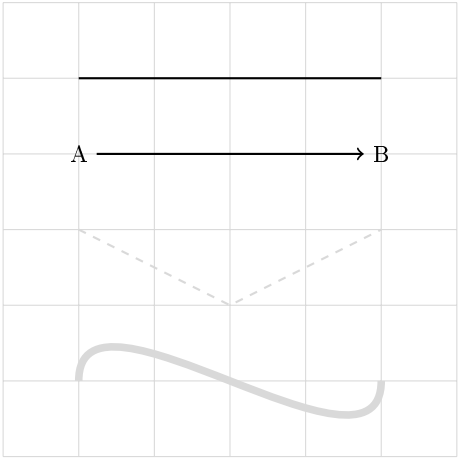


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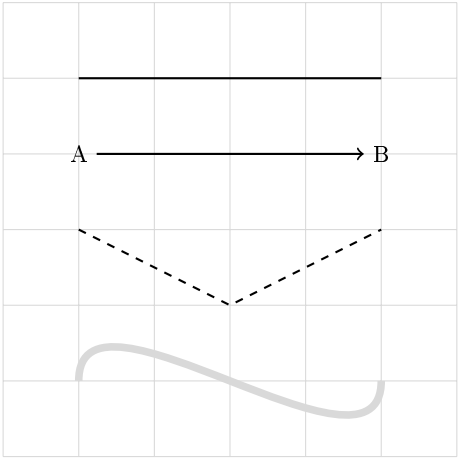


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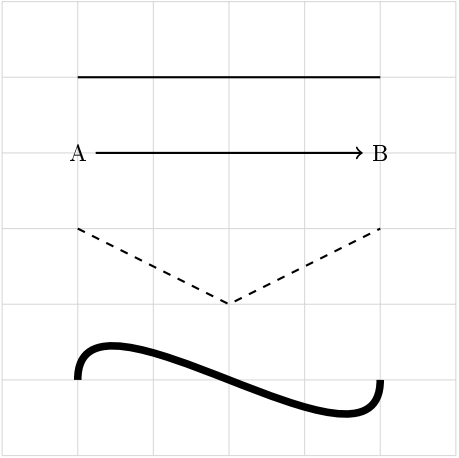


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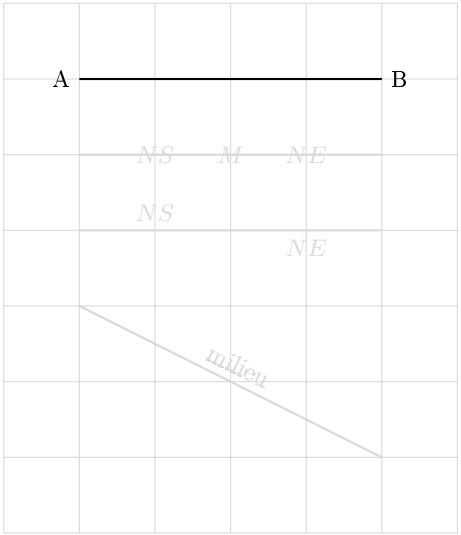
\end{tikzpicture}
```

Écrire sur des traits


```
\begin{tikzpicture}
  \draw (0,0) node[left] {A} -- (3,0) node[right] {B};
  \draw (0,-1) -- (4,-1) node[midway] {$M$}
                         node[near start] {$NS$}
                         node[near end] {$NE$};
  \draw (0,-2) -- (4,-2) node[near start, above] {$NS$}
                         node[near end, below] {$NE$};
  \draw (0,-3) -- (4,-5)
        node[midway,above,sloped] {milieu};
\end{tikzpicture}
```

Écrire sur des traits

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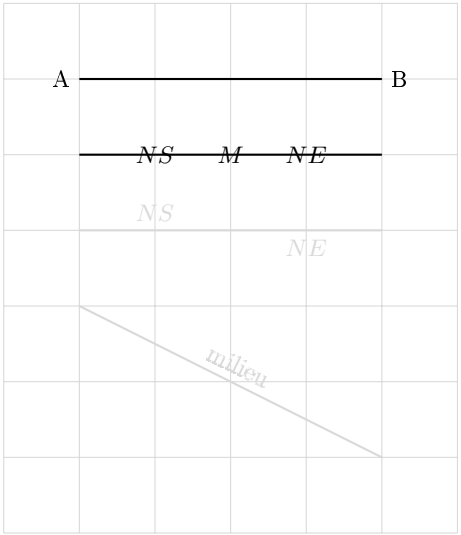


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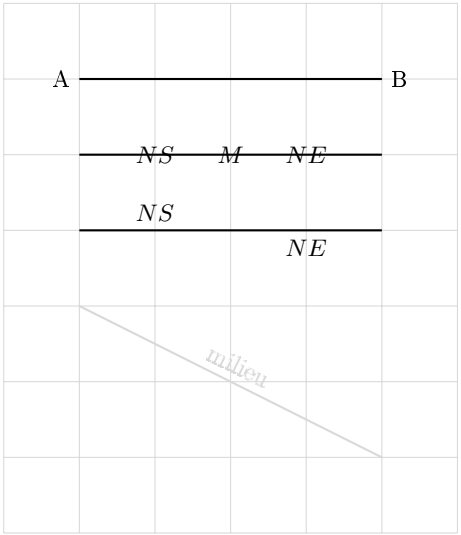


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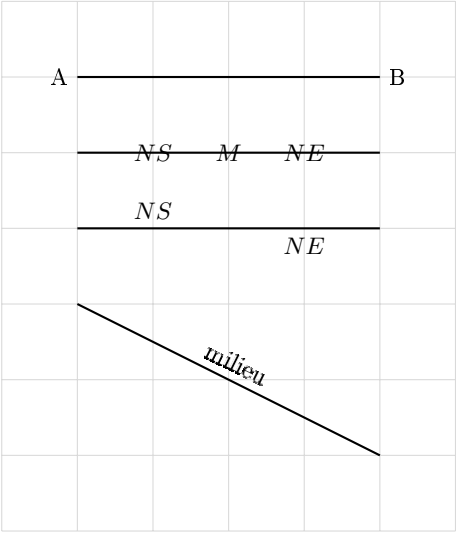


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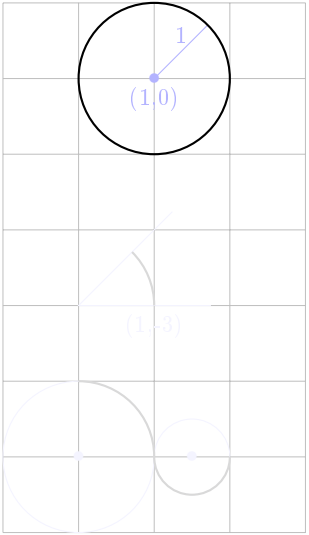
\end{tikzpicture}
```

Cercle & arc de cercle


```
\begin{tikzpicture}
  \draw[thick] (1,0) circle (1);
  \draw[thick] (1,-3) arc (0:45:1);
  \draw[thick] (0,-4) arc (90:0:1) --
               (1,-5) arc (-180:0:0.5);
\end{tikzpicture}
```

Cercle & arc de cercle

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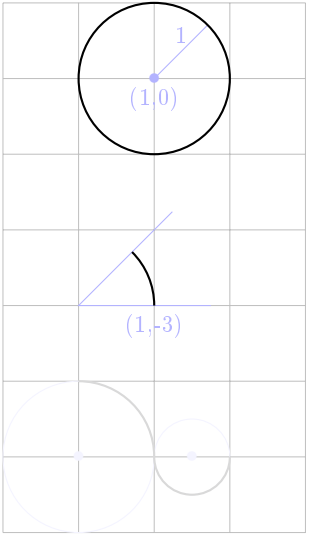


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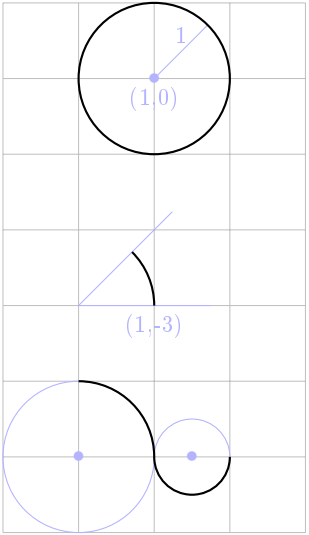


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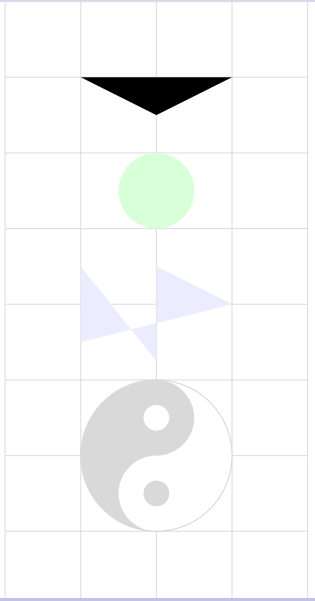
\end{tikzpicture}
```

Aplat de couleur


```
\begin{tikzpicture}
  \fill (-1,5) -- (0,4.5) -- (1,5);
  \fill[color=green] (0,3.5) circle (0.5);
  \fill[color=blue!50] (-1,1.5) -- (-1,2.5) --
                       (0,1.25) -- (0,2.5) -- (1,2);
  \fill (0,0) circle (1);
  \fill[color=white] (0,1) arc (90:-90:0.5) --
                     (0,0) arc (90:270:0.5) -- (0,-1) arc (-90:90:1);
  \fill[color=white] (0,0.5) circle (0.17);
  \fill[color=black] (0,-0.5) circle (0.17);
\end{tikzpicture}
```

Aplat de couleur



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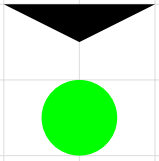


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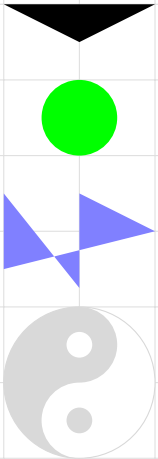

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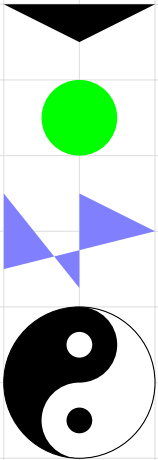

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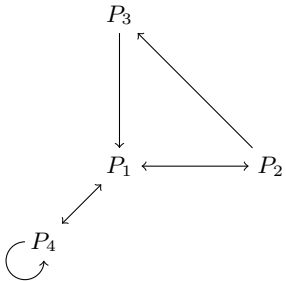
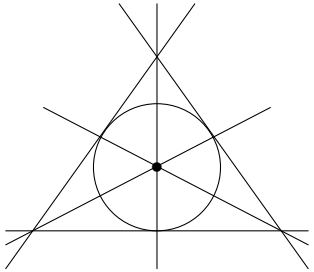
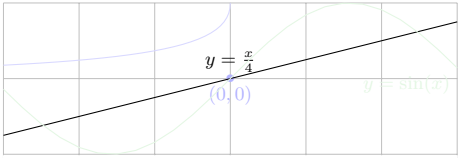
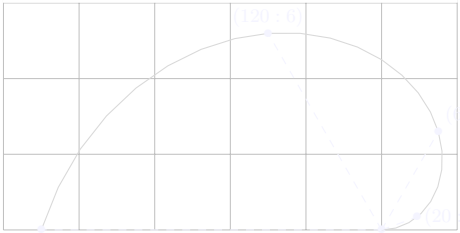
```

$$\begin{array}{ccc} \pi_1(B_1) & \xrightarrow{i_*} & \pi_1(E_1) \\ \downarrow\wr & & \downarrow\wr \\ \pi_1(B_2) & \xrightarrow{j_*} & \pi_1(E_2) \end{array} \qquad \pi_1(E_1), \pi_1(E_2) \hookrightarrow \mathbb{C}^n$$





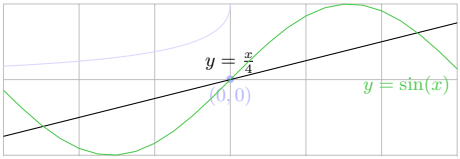


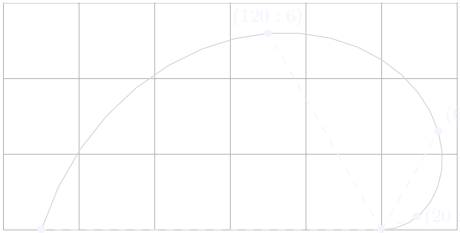



```
\begin{tikzpicture}
  \draw[domain=-3:3] plot (\x, \x/4)
    node[midway,above] {$y=\frac{x}{4}$};
  \draw[domain=-3:3,color=green!70!black!70]
    plot (\x, {sin(deg(\x))})
    node[below left] {$y=\sin(x)$};
  \draw[domain=-1.732:0,color=blue]
    plot[variable=\t] (\t^2, {exp(\t)})
    node[above] {$\{(t^2,e^t)\mid t\in\RR\}$};
\end{tikzpicture}
```

```
\begin{tikzpicture}
  \draw [domain=0:9, scale=0.5] plot (20*\x:\x);
\end{tikzpicture}
```

Paramétrage cartésien et polaire



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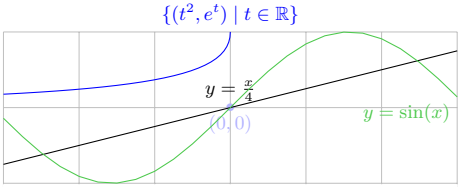


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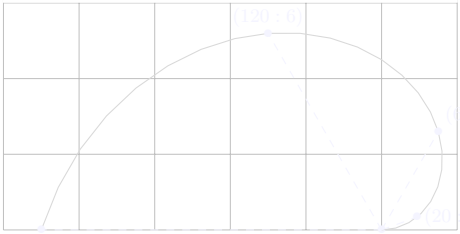


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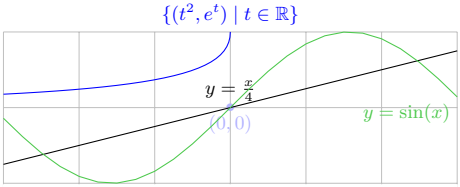
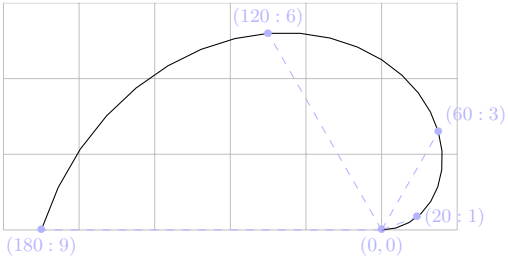
\end{tikzpicture}
```

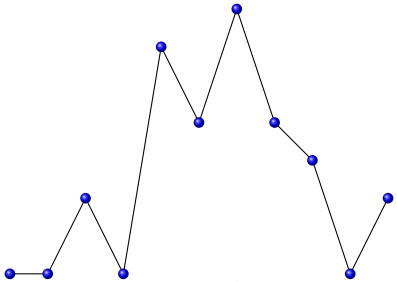





```
\begin{tikzpicture}
  \draw[domain=-3:3] plot (\x, \x/4)
    node[midway,above] {$y=\frac{x}{4}$};
  \draw[domain=-3:3,color=green!70!black!70]
    plot (\x, {sin(deg(\x))})
    node[below left] {$y=\sin(x)$};
  \draw[domain=-1.732:0,color=blue]
    plot[variable=\t] (\t^2, {exp(\t)})
    node[above] {$\{(t^2,e^t)\mid t\in\RR\}$};
\end{tikzpicture}
```

```
\begin{tikzpicture}
  \draw [domain=0:9, scale=0.5] plot (20*\x:\x);
\end{tikzpicture}
```

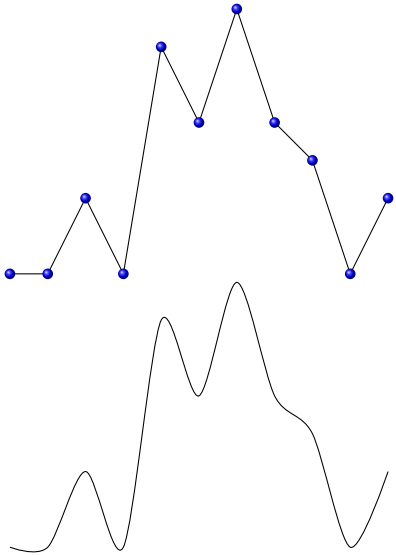
Plots coordonnées



```
\begin{tikzpicture}
  \draw plot[mark=ball] coordinates {(0,0) (0.5,0)
    (1,1) (1.5,0) (2,3) (2.5,2) (3,3.5) (3.5,2)
    (4,1.5) (4.5,0) (5,1)};
\end{tikzpicture}
```

- On peut aussi prendre les donnés d'après un **fichier** ***.txt** avec les coordonnées par colonnes !
- L'option **smooth** nous produise des objets lisses.

```
\begin{tikzpicture}
  \draw plot[smooth] file {donnees.txt};
\end{tikzpicture}
```



```
\begin{tikzpicture}
  \draw plot[mark=ball] coordinates {(0,0) (0.5,0)
    (1,1) (1.5,0) (2,3) (2.5,2) (3,3.5) (3.5,2)
    (4,1.5) (4.5,0) (5,1)};
\end{tikzpicture}
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\begin{tikzpicture}
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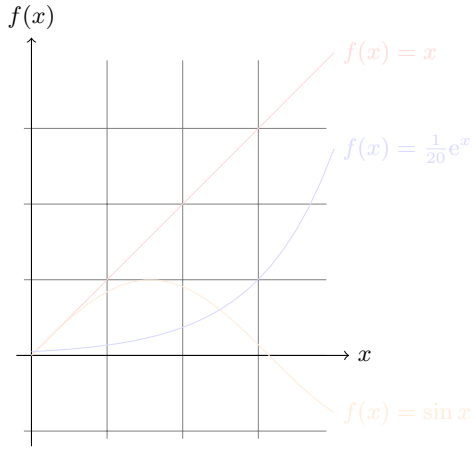
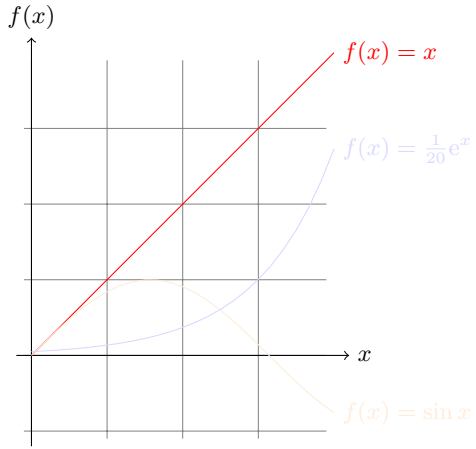


Fonctions disponibles sur Tikz :

- Opérations basiques, modulo, maximum, minimum, arrondi ou partie entière.
- Valeur absolue, exponentielle, logarithme népérien, racine carrée et fonctions trigonométriques.

En géneral, il faudra utiliser l'opération `plot function` qui fait appel automatique au logiciel libre Gnuplot.

```
\begin{tikzpicture}[domain=0:4]
  \draw[color=red] plot[id=x] function{x}
    node[right] {$f(x)=x$};
  \draw[color=orange] plot[id=sin] function{sin(x)}
    node[right] {$f(x)=\sin x$};
  \draw[color=blue] plot[id=exp] function{exp(x)/20}
    node[right] {$f(x)=\frac{1}{20}\mathrm e^x$};
\end{tikzpicture}
```



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\end{tikzpicture}
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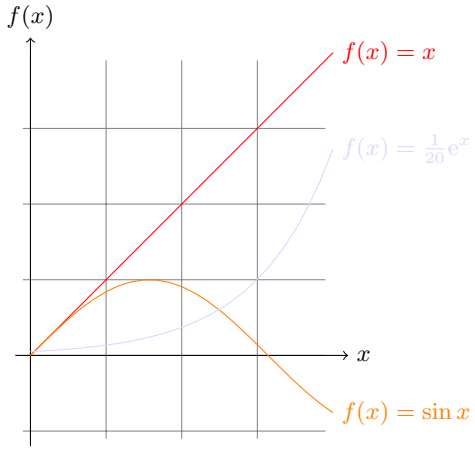

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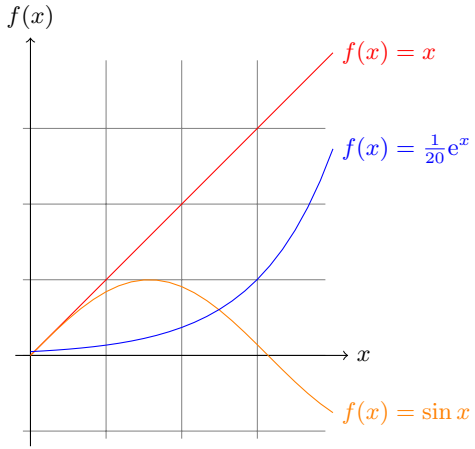
  \draw[color=blue] plot[id=exp] function{exp(x)/20}
    node[right] {$f(x)=\frac{1}{20}\mathrm e^x$};
\end{tikzpicture}
```



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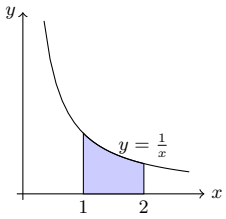
    node[right] {$f(x)=\frac{1}{20}\mathrm e^x$};
\end{tikzpicture}
```

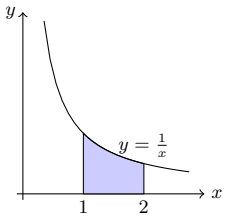
Aire sous une courbe

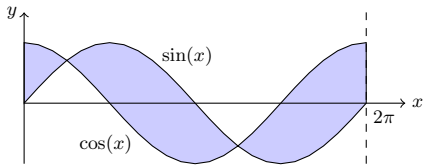



```
\begin{tikzpicture}
  \filldraw [fill=blue!20,draw=black] (1,0) -- (1,1)
    -- plot [domain=1:2] (\x,1/\x)
    node[above] {$y=\frac{1}{x}$} -- (2,0) -- cycle;
  \draw[domain=0.35:2.75] plot (\x,1/\x);
\end{tikzpicture}
```

```
\begin{tikzpicture}
  \filldraw [draw=black,fill=blue!20]
    plot [domain=0:2*pi] (\x,{sin(\x r)})
    -- plot [domain=2*pi:0] (\x,{cos(\x r)})
    -- cycle;
  \draw[dashed] (2*pi,-1) -- (2*pi,1.5);
\end{tikzpicture}
```

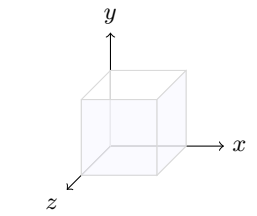
Aire sous une courbe





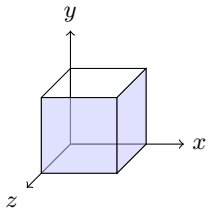

```
\begin{tikzpicture}
  \filldraw [fill=blue!20,draw=black] (1,0) -- (1,1)
    -- plot [domain=1:2] (\x,1/\x)
    node[above] {$y=\frac{1}{x}$} -- (2,0) -- cycle;
  \draw[domain=0.35:2.75] plot (\x,1/\x);
\end{tikzpicture}
```

```
\begin{tikzpicture}
  \filldraw [draw=black,fill=blue!20]
    plot [domain=0:2*pi] (\x,{sin(\x r)})
    -- plot [domain=2*pi:0] (\x,{cos(\x r)})
    -- cycle;
  \draw[dashed] (2*pi,-1) -- (2*pi,1.5);
\end{tikzpicture}
```




```
\begin{tikzpicture}
  \draw (0,0,0)--(1,0,0)--(1,1,0)--(0,1,0)--cycle;
  \draw (0,0,1)--(1,0,1)--(1,1,1)--(0,1,1)--cycle;
  \draw (0,0,0) -- (0,0,1); \draw (1,0,0) -- (1,0,1);
  \draw (1,1,0) -- (1,1,1); \draw (0,1,0) -- (0,1,1);
  \draw[fill=blue!20,opacity=0.6] (0,0,1) -- (1,0,1)
    -- (1,1,1) -- (0,1,1) -- cycle;
  \draw[fill=blue!20,opacity=0.6] (1,0,0) -- (1,1,0)
    -- (1,1,1) -- (1,0,1) -- cycle;

  \foreach \t in {0,0.05,...,1} {
    \filldraw[color=blue!20] plot[domain=0:2*pi]
      ({sqrt(1-\t^2)*cos(\x r)}, \t, {sqrt(1-\t^2)*sin(\x r)});
    \draw[smooth, color=black] plot[domain=0:2*pi]
      ({sqrt(1-\t^2)*cos(\x r)}, \t, {sqrt(1-\t^2)*sin(\x r)});
  }
  \draw[smooth, color=blue,samples=1000] plot[domain=1:2]
  ({(2-\x)^2*cos(16*pi*\x r)}, \x, {(2-\x)^2*sin(16*pi*\x r)});
\end{tikzpicture}
```




```
\begin{tikzpicture}
  \draw (0,0,0)--(1,0,0)--(1,1,0)--(0,1,0)--cycle;
  \draw (0,0,1)--(1,0,1)--(1,1,1)--(0,1,1)--cycle;
  \draw (0,0,0) -- (0,0,1); \draw (1,0,0) -- (1,0,1);
  \draw (1,1,0) -- (1,1,1); \draw (0,1,0) -- (0,1,1);
  \draw[fill=blue!20,opacity=0.6] (0,0,1) -- (1,0,1)
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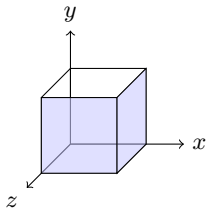
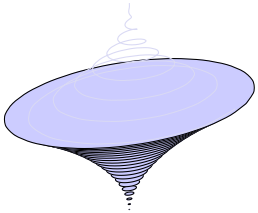
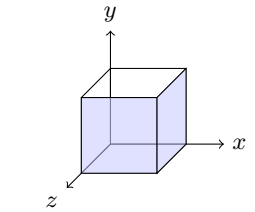
    \draw[smooth, color=black] plot[domain=0:2*pi]
      ({sqrt(1-\t^2)*cos(\x r)}, \t, {sqrt(1-\t^2)*sin(\x r)});
  }
  \draw[smooth, color=blue,samples=1000] plot[domain=1:2]
  ({(2-\x)^2*cos(16*pi*\x r)}, \x, {(2-\x)^2*sin(16*pi*\x r)});
\end{tikzpicture}
```

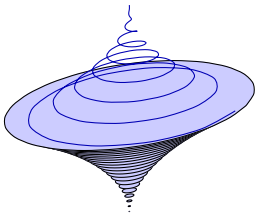




```
\begin{tikzpicture}
  \draw (0,0,0)--(1,0,0)--(1,1,0)--(0,1,0)--cycle;
  \draw (0,0,1)--(1,0,1)--(1,1,1)--(0,1,1)--cycle;
  \draw (0,0,0) -- (0,0,1); \draw (1,0,0) -- (1,0,1);
  \draw (1,1,0) -- (1,1,1); \draw (0,1,0) -- (0,1,1);
  \draw[fill=blue!20,opacity=0.6] (0,0,1) -- (1,0,1)
    -- (1,1,1) -- (0,1,1) -- cycle;
  \draw[fill=blue!20,opacity=0.6] (1,0,0) -- (1,1,0)
    -- (1,1,1) -- (1,0,1) -- cycle;

  \foreach \t in {0,0.05,...,1} {
    \filldraw[color=blue!20] plot[domain=0:2*pi]
      ({sqrt(1-\t^2)*cos(\x r)}, \t, {sqrt(1-\t^2)*sin(\x r)});
    \draw[smooth, color=black] plot[domain=0:2*pi]
      ({sqrt(1-\t^2)*cos(\x r)}, \t, {sqrt(1-\t^2)*sin(\x r)});
  }
  \draw[smooth, color=blue,samples=1000] plot[domain=1:2]
  ({(2-\x)^2*cos(16*pi*\x r)}, \x, {(2-\x)^2*sin(16*pi*\x r)});
\end{tikzpicture}
```





```
\begin{tikzpicture}
  \draw (0,0,0)--(1,0,0)--(1,1,0)--(0,1,0)--cycle;
  \draw (0,0,1)--(1,0,1)--(1,1,1)--(0,1,1)--cycle;
  \draw (0,0,0) -- (0,0,1); \draw (1,0,0) -- (1,0,1);
  \draw (1,1,0) -- (1,1,1); \draw (0,1,0) -- (0,1,1);
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    -- (1,1,1) -- (0,1,1) -- cycle;
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    -- (1,1,1) -- (1,0,1) -- cycle;

  \foreach \t in {0,0.05,...,1} {
    \filldraw[color=blue!20] plot[domain=0:2*pi]
      ({sqrt(1-\t^2)*cos(\x r)}, \t, {sqrt(1-\t^2)*sin(\x r)});
    \draw[smooth, color=black] plot[domain=0:2*pi]
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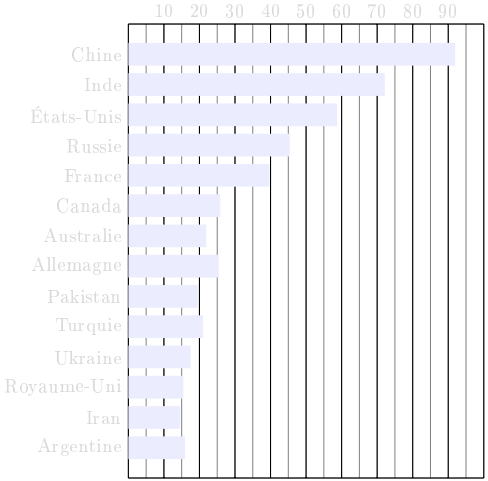
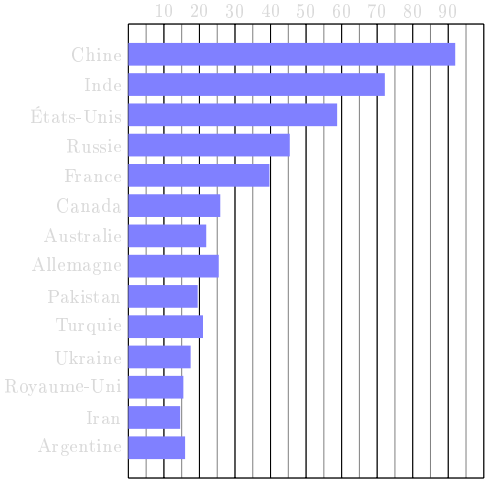
  \draw[smooth, color=blue,samples=1000] plot[domain=1:2]
  ({(2-\x)^2*cos(16*pi*\x r)}, \x, {(2-\x)^2*sin(16*pi*\x r)});
\end{tikzpicture}
```

Diagramme en bâton




```
\begin{tikzpicture}
  \draw[gray,very thin] (0,0)
    grid[xstep=5,ystep=15] (100,15);
  \draw (0,0) grid[xstep=10,ystep=15] (100,15);
  \draw[line width=3mm,color=blue!50]
    plot[xcomb] file {producBle2004.txt};
  \foreach \x in {10,20,...,90}
    \draw(\x,15) node[above]{\x};
  \foreach \n/\y in {Chine/14,Inde/13,États-Unis/12,
    Russie/11,France/10,Canada/9,Australie/8,
    Allemagne/7,Pakistan/6,Turquie/5,Ukraine/4,
    Royaume-Uni/3,Iran/2,Argentine/1}
    \draw (0,\y) node [left] {\n};
\end{tikzpicture}
```

Diagramme en bâton

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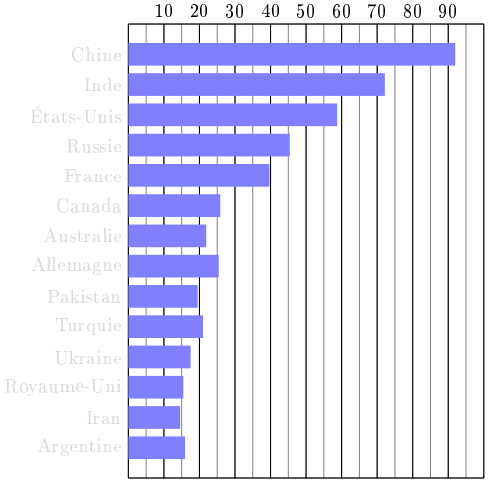


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    \draw (0,\y) node [left] {\n};
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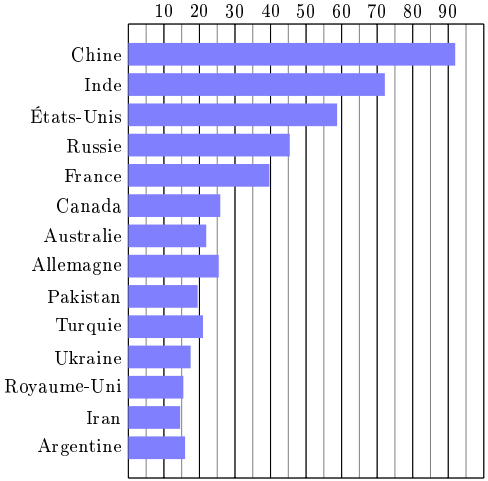
Diagramme en bâton

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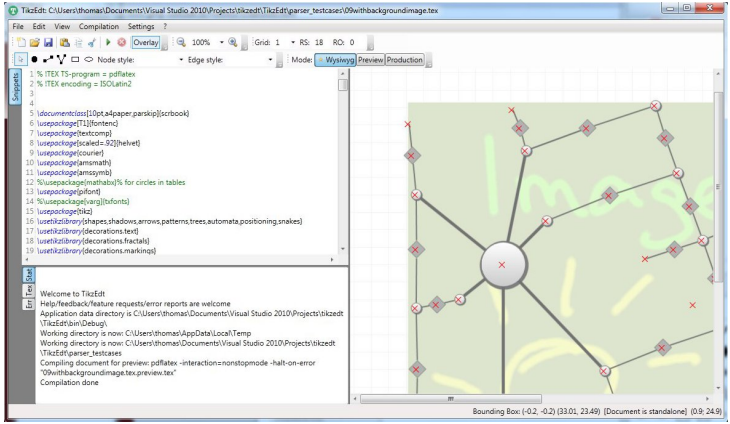
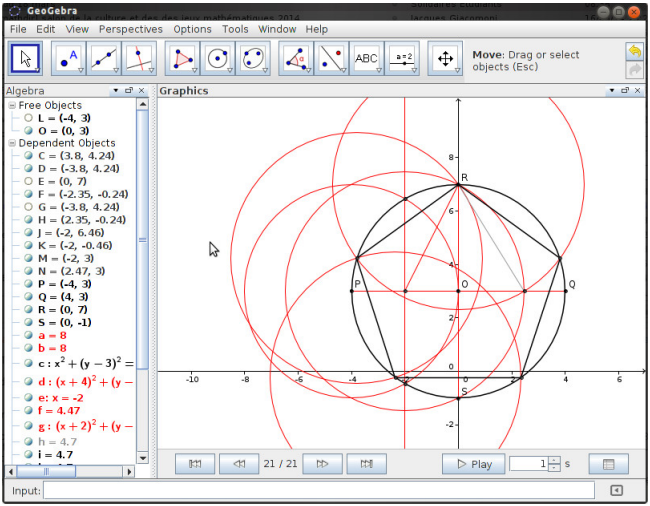
    grid[xstep=5,ystep=15] (100,15);
  \draw (0,0) grid[xstep=10,ystep=15] (100,15);
  \draw[line width=3mm,color=blue!50]
    plot[xcomb] file {producBle2004.txt};
  \foreach \x in {10,20,...,90}
    \draw(\x,15) node[above]{\x};
  \foreach \n/\y in {Chine/14,Inde/13,États-Unis/12,
    Russie/11,France/10,Canada/9,Australie/8,
    Allemagne/7,Pakistan/6,Turquie/5,Ukraine/4,
    Royaume-Uni/3,Iran/2,Argentine/1}
    \draw (0,\y) node [left] {\n};
\end{tikzpicture}
```

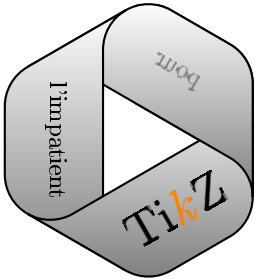


- Votre compilateur LaTeXhabituel.
- (WYSIWYG) pour TikZ :
  - TikzEdt (Windows).
  - KTikz/QTikz (Linux).
  - TikzIt.
- Matlab, R ou Inkscape ont des modules pour exporter images dans code TikZ.

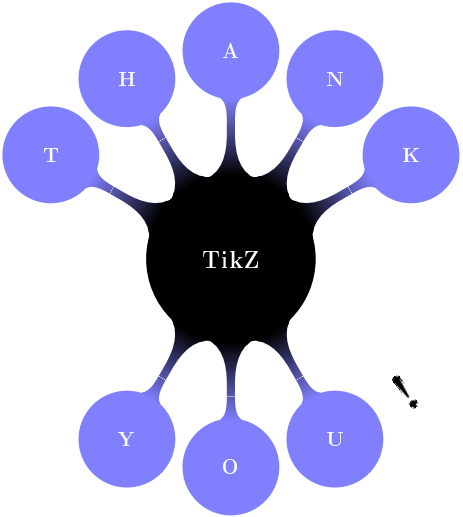


- GeoGebra (`http://www.geogebra.org`) est un logiciel gratuit de géométrie dynamique en 2D et 3D écrit en Java.
- Il est très puissant pour expérimenter en géométrie, algèbre, calcul différentiel ou probabilités.
- Il nous permet d'étudier l'objet géométrique avant le dessiner sur TikZ (calcul de coordonnées, objets dépendants d'autres,...).
- On peut aussi exporter un dessin directement sur code TikZ !

- *T*ikZ pour l'impatient : `http://math.et.info.free.fr/TikZ/`



- *T*ikZ/Pgf Official Manual : `http://sourceforge.net/projects/pgf/`
- Exemples et ressources TikZ : `http://www.texample.net/tikz/examples/`




```
\usetikzlibrary{mindmap}
\begin{tikzpicture}[mindmap]
  \node [concept] {\Huge\bf TikZ}
    child[grow=150] {node[concept] {T}}
    child[grow=120] {node[concept] {H}}
    child[grow=90] {node[concept] {A}}
    child[grow=60] {node[concept] {N}}
    child[grow=30] {node[concept] {K}}
    child[grow=-120] {node[concept] {Y}}
    child[grow=-90] {node[concept] {O}}
    child[grow=-60] {node[concept] {U}};
  \node[text=black,rotate=35,scale=2]
       at (4.2,-3.2) {\Huge\bf !};
\end{tikzpicture}
```