

QUELQUES SUBTILITÉS AVEC TIKZ

1-Introduction

Pour réaliser un dessin avec TikZ, mettre les packages `tikz` et son associé `pgf` dans le préambule.

Il y a 2 façons de procéder pour réaliser un dessin avec TikZ :

- utiliser la commande `\tikz`
- utiliser l'environnement `tikzpicture`

Dans les 2 cas, il faut faire attention à ne jamais oublier le `;` en fin de ligne d'instruction.

Des «libraries» ou bibliothèques de commandes supplémentaires devront parfois être ajoutées dans le préambule avec la commande `\usetikzlibrary{<nom de la library>}`

Remarque : si la compilation se fait en `pdflatex`, si le package `babel` option `french` se trouve dans le préambule et si le caractère `;` est utilisé dans un environnement `tikzpicture` ou après la commande `\tikz`, alors il faut procéder comme suit :

```
\shorthandoff{:}\begin{tikzpicture} ... \end{tikzpicture}\shorthandon{:}
\shorthandoff{:}\tikz... \shorthandon{:}
```

2-Boucles avec \foreach

Boucle à un paramètre :

```
\tikz\foreach \x in {0,...,10} \node at (3*\x/2,0) {$A_{\x}$};
A_0      A_1      A_2      A_3      A_4      A_5      A_6      A_7      A_8      A_9      A_10

\tikz\foreach \x in {-4,-3,-2,-1,1,2,3,4,5,6,7}
\draw[shift={(\x,0)},color=black] (0pt,2pt) -- (0pt,-2pt) node[below] {\footnotesize $\x$};
-4      -3      -2      -1              1      2      3      4      5      6      7
```

Autres exemples de listes :

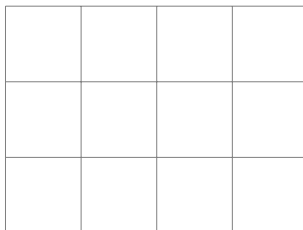
```
{1,...,6}
{1,3,...,11}
{Z,X,...,M}
{2^1,2^....,2^7}
{0cm,0.5cm,...cm,3cm}
{A_1,..._1,H_1}
```

Boucle à deux paramètres :

```
\tikz\foreach \x/\y in {0/1,1/2,2/3} \node at (\x,\y) {$\bullet$};
```

3-Placer une grille

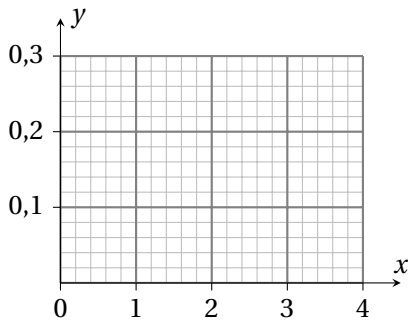
Voici une grille de carreaux de 1 cm de côté en gris. (Les coordonnées indiquées sont : le premier couple pour le coin en bas à gauche, le deuxième couple pour le coin en haut à droite)



```
\tikz\draw[help lines] (0,0)grid(4,3);
```

La même grille graduée en style papier millimétré :

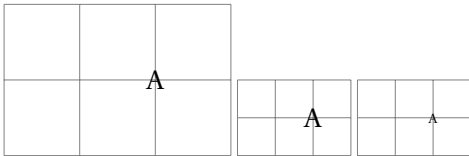
```
\begin{tikzpicture}
\draw[thin,step=.2,lightgray] (0,0)grid(4,3);
\draw[thick,gray] (0,0)grid(4,3);
\draw[stealth-stealth] (0,3.5)node[right] {$y$}|-(4.5,0)node[above] {$x$};
\foreach \x in {0,...,4} \draw (\x,-.1)node[below]{\x} -- (\x,0);
\foreach \y in {1,...,3} \draw (-.1,\y)node[left]{0,\y} -- (0,\y);
\end{tikzpicture}
```



```

\begin{tikzpicture}
\draw[help lines](0,0)grid(3,2);
\node at(2,1){A};
\end{tikzpicture}
\begin{tikzpicture}[scale=.5]% Le dessin est réduit de moitié mais pas le texte
\draw[help lines](0,0)grid(3,2);
\node at(2,1){A};
\end{tikzpicture}
\begin{tikzpicture}[scale=.5, transform shape]% Le dessin est réduit de moitié et le texte aussi
\draw[help lines](0,0)grid(3,2);
\node at(2,1){A};
\end{tikzpicture}

```



4-Tracé d'un segment entre 2 points

Quelles que soient les coordonnées choisies le dessin prend le minimum de surface sur la feuille. S'il est placé après un texte, le coin inférieur gauche prend la place du caractère suivant d'un texte. L'option `baseline` peut permettre d'en décider autrement :

```

\tikz\draw(0,1)--(3,1) ; ou \tikz[baseline=0pt]\draw(0,1)--(3,1) ;
\tikz[baseline=1cm]\draw(0,1)--(3,1) ;

```

```

\tikz\draw (0,0)--(3,0);_____

```

La commande `\coordinate` permet de désigner un point pour une utilisation ultérieure qui peut s'avérer plus pratique dans un schéma complexe :

```

\begin{tikzpicture}
\coordinate (A) at (0,0);
\coordinate (B) at (3,0);
\draw (A) -- (B);
\end{tikzpicture}

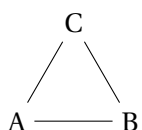
```

Dans la même idée, en utilisant `\node` et une boucle :

```

\node (a) at (0, 0) {A};
\node (b) at +(0: 1.5) {B};
\node (c) at +(60: 1.5) {C};
\foreach \from/\to in {a/b, b/c, c/a}
\draw(\from) -- (\to);

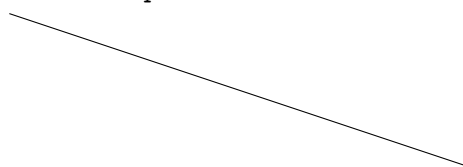
```



Un facteur multiplicatif ou une combinaison linéaire peut être utilisé avec des coordonnées.

Il faut ajouter `\usetikzlibrary{calc}` dans le préambule :

```
\begin{tikzpicture}
\coordinate (A) at (0,1);
\coordinate (B) at (3,1);
\draw (A) -- ($2*(B)-3*(A)$);
\end{tikzpicture}
```



Les coordonnées peuvent être des opérations à effectuer :

```
\tikz\draw (3^2-9,0)--(2*1.5,{sin(0)});
```

Il peut être nécessaire de passer par des affectations de variables :

```
\begin{tikzpicture}
\def \xa{0};
\def \xb{3};
\def \ya{0};
\def \yb{0};
\draw (\xa,\ya) -- (\xb,\yb);
\end{tikzpicture}
```

```
\tikz\draw(canvas cs:x=0cm,y=1cm) -- (canvas cs:x=3cm,y=1cm);
```

```
\tikz\draw (canvas polar cs:radius=2cm,angle=30)-- (90:2);
```

```
\tikz\draw (canvas polar cs:radius=2cm,angle=pi/6 r)-- (pi/2 r:2);
```

Le `rad()` est une autre façon de dire que l'argument est en radian

```
\begin{tikzpicture}
\draw (0,0)--(3,0) ;
\draw[shift={(2,1)}] (0,0)--(3,0) ;
\end{tikzpicture}
```

4.1-Quelques options

```
tikz\draw[line width=1mm] (0,0)--(3,0);
```

Autres possibilités : ultra thin, very thin, thin, semithick, thick, very thick, ultra thick

```
tikz\draw[double] (0,0)--(3,0);
```

```
tikz\draw[double distance=1ex] (0,0)--(3,0);
```

```
tikz\draw[dashed] (0,0)--(3,0);
```

Autres possibilités : solid, dotted, densely dotted, loosely dotted, densely dashed, loosely dashed, dashdotted, densely dash-dotted, loosely dashdotted, dashdotdotted, densely dashdotdotted, loosely dashdotdotted

```
\tikz\draw[->] (0,0)--(3,0);
```

```
\tikz\draw[-to] (0,0)--(3,0);
```

```
\tikz\draw[-latex] (0,0)--(3,0);
```

```
\tikz\draw[->,>=latex] (0,0)--(3,0);
```

```
\tikz\draw[-stealth] (0,0)--(3,0);
```

```

\tikz\draw[->] (0,0)--(3,0);
Avec \usetikzlibrary{arrows}:-o,-*
\tikz\draw[o-*] (0,0)--(3,0);
\tikz\draw[shorten <= .25cm, shorten >= .5cm] (0,0) -- (3,0);
\tikz\draw[shorten <= -.5cm, shorten >= -1cm] (0,0) -- (3,0);

```

4.2-Décorations diverses

```

Avec \usetikzlibrary{decorations.pathmorphing}
\tikz\draw[decorate,decoration=random steps] (0,0)--(3,0);
\tikz\draw[decorate,decoration={random steps,segment length=2pt,amplitude=0.2cm}] (0,0)--(3,0);
\tikz\draw[decorate,decoration=saw] (0,0)--(3,0);
\tikz\draw[decorate,decoration={saw,segment length=2pt,amplitude=0.2cm}] (0,0)--(3,0);
\tikz\draw[decorate,decoration=zigzag] (0,0)--(3,0);
\tikz\draw[decorate,decoration={zigzag,segment length=2pt,amplitude=0.2cm}] (0,0)--(3,0);
\tikz\draw[decorate,decoration=bumps] (0,0)--(3,0);
\tikz\draw[decorate,decoration={bumps,segment length=20pt,amplitude=0.2cm}] (0,0)--(3,0);
\tikz\draw[decorate,decoration=coil] (0,0)--(3,0);
\tikz\draw[decorate,decoration={coil,segment length=10pt,amplitude=0.2cm,aspect=.8}] (0,0)--(3,0);
\tikz\draw[decorate,decoration=snake] (0,0)--(3,0);
\tikz\draw[decorate,decoration={snake,segment length=10pt,amplitude=0.2cm}] (0,0)--(3,0);
Avec \usetikzlibrary{decorations.pathreplacing}
\tikz\draw[decorate,decoration=border] (0,0)--(3,0);
\tikz\draw[decorate,decoration={border,segment length=10pt,amplitude=0.2cm,angle=90}] (0,0)--(3,0);
\tikz\draw[decorate,decoration=brace] (0,0)--(3,0);
\tikz\draw[decorate,decoration={brace,amplitude=0.5cm}] (0,0)--(3,0);
\tikz\draw[decorate,decoration={brace,aspect=0.7}] (0,0)--(3,0);
\tikz\draw[decorate,decoration={brace,raise=0.25cm}] (0,0)--(3,0);
\tikz\draw[decorate,decoration={brace,mirror}] (0,0)--(3,0);
\tikz\draw [decorate,decoration={expanding waves}] (0,0) - - (3,0) ;
\tikz\draw [decorate,decoration={expanding waves,segment length=2mm,angle=10}] (0,0) - - (3,0) ;
\tikz\draw [decorate,decoration=ticks] (0,0) - - (3,0) ;
\tikz\draw [decorate,decoration={ticks,segment length=5mm,amplitude=5mm}] (0,0) - - (3,0) ;

```

```
Avec \usetikzlibrary{decorations.markings}
```

```
\tikz\draw [decorate,decoration={markings,mark=between positions 0 and 1 step 5mm  
with { \draw[red] (-2pt,-2pt) - - (2pt,2pt) ; \draw[red](2pt,-2pt) - - (-2pt,2pt) ;  
\draw[red] (-2pt,-2pt) rectangle (2pt,2pt) ; }]} (0,0) - - (3,0) ;
```

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```
\tikz\draw [decorate,decoration={markings,mark=at position 1cm with  
\node[red]{\blacktriangleright}}] (0,0)--(3,0);
```



```
\tikz\draw[decorate,decoration={ markings,mark=at position 1cm  
with {\arrow[red]{>}} ;}] (0,0) - - (3,0) ;
```



```
\tikz\draw[decorate,decoration={ markings,mark=at position 1cm  
with {\arrowreversed[red]{>}} ;}] (0,0) - - (3,0) ;
```



```
\tikz\draw[decoration={markings, mark=at position 0.2  
with {\arrow{>}}},postaction={decorate}] (0,0)--(2,0);
```



```
\tikz\draw[decoration={markings, mark=at position 0.825  
with {\arrowreversed{>}}}, postaction={decorate}] (0,0)--(2,0);
```



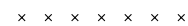
```
\usetikzlibrary{decorations.footprints}
```

```
\tikz\draw[decorate,decoration=footprints] (0,0)--(3,0);
```



```
\usetikzlibrary{decorations.shapes}
```

```
\tikz\draw[decorate,decoration=crosses] (0,0)--(3,0);
```



```
\tikz\draw[decorate,decoration=triangles] (0,0)--(3,0);
```



```
\tikz\draw[decorate,decoration=shape backgrounds] (0,0)--(3,0);
```



```
\tikz\draw[decorate,decoration={shape backgrounds,shape=dart,shape size=2mm},  
draw=red,fill=red] (0,0)--(3,0);
```



```
\tikz\draw[decorate,decoration={ shape backgrounds,shape=cloud,shape size=.5cm,shape sep=1cm}]  
(0,0) - - (3,0) ;
```



autres formes :

dart star diamond rectangle regular polygon signal kite cloud starburst tape circle
de nombreuses options sont possibles.

5-Segments successifs

```
\tikz\draw(0,0)--(1,0)--(1,1)--(0,1);
```



```
\tikz\draw(0,0)to(1,0)to(1,1)to(0,1);
```



```
\tikz\draw(0,0)--(1,0)--(1,1)--(0,1)--cycle;
```



```
\tikz\draw(0,0)--(1,0)--++(1,1)--++(0,1);
```



```
\tikz\draw(0,0)--++(right:1)--++(up:1)--++(left:1);
```



```
\tikz\draw(0,0)--(1,0)--+(1,1)--+(0,1);
```



```

\tikz\draw (0,0) |- (1,1) -| (2,0) ;
\tikz\draw(0,0)edge(1,0)edge(1,1)edge(0,1);
\tikz\draw(0:0)--(0:1)--(30:2)--(-30:2);
\tikz\draw(0:0)--(0:1)--+(30:2)--+(-30:2);
\tikz\draw(0:0)--(0:1)--++(30:2)--++(-30:2);

```

5.1-Quelques options

```

\tikz\draw [rounded corners=0.5cm] (0,0) - - (1,2)[sharp corners] - - (2,0) - - cycle ;

```

6-Rectangle

```

\tikz\draw (-1,-1) rectangle ++(3,1);
Avec \usetikzlibrary{patterns}
\tikz\draw [pattern=north east lines](0,0)rectangle (3,2);

```

7-Cercle, ellipse et leurs arcs

```

\tikz\draw (1,1) circle (1);
\tikz\draw (1,1) circle[radius=1cm];
\tikz\draw (1,1) ellipse (1 and .5) ;
\tikz\draw (1,1) ellipse [x radius=1cm,y radius=.5cm] ;
\tikz\draw (-2,0) arc (180 :-120 :2 and 1);

```

Il faut ajouter \usetikzlibrary{through} dans le préambule :

```

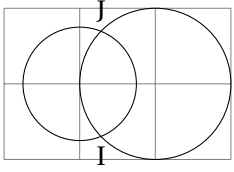
\begin{tikzpicture}
\draw[help lines](0,0)grid(3,2);
\coordinate (A) at (1,1);

```

```

\coordinate (B) at (2,1);
\node(D)[draw,minimum size=1.5cm,circle] at (A) {};
\node(E)[draw,circle through=(A)] at (B) {};
\node[below] at (intersection 1 of D and E){I};
\node[above] at (intersection 2 of D and E){J};
\end{tikzpicture}

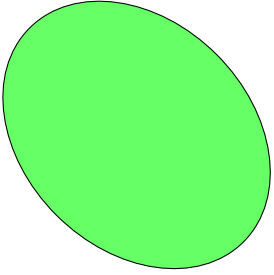
```



```

\tikz\draw[fill=green!60,rotate around={-45:(0.2,10)}] (0.2,10) ellipse (2cm and 1.5cm);

```



```

\tikz\draw [ball color=gray] (0,0) circle (0.4) ;

```



8–Autres courbes

8.1–Courbes de Bézier

```

\tikz\draw(0,0)--(1,0)--(1,1)--(0,1);

```



```

\tikz\draw(0,0)..controls(1,0)and (1,1)..(0,1);

```



8.2–Autres liaisons

```

\tikz\draw(0,0)to(1,0)to(1,1)to(0,1);

```



```

\tikz\draw(0,0)to[out=90, in=-90](1,0)to[out=-180, in=0](1,1)to(0,1);

```



```

\tikz\draw(0,0)to[bend left](1,0)to[bend right](1,1)to(0,1);

```



```

\tikz\draw(0,0)to[bend left=90](1,0)to[bend right=-45](1,1)to(0,1);

```

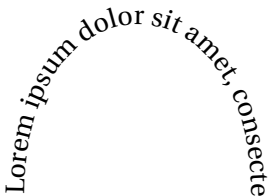


Avec `\usetikzlibrary{decorations.text}` il est possible de relier avec du texte :

```

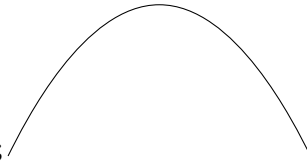
\tikz\draw[decorate,decoration={text along path,
text={Lorem ipsum dolor sit amet, consectetur adipiscing elit.}}]
(0,0)..controls(0,3) and (3,3)..(3,0);

```



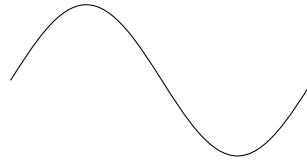
8.3-Parabole

```
\tikz\draw(-1,-2) parabola bend (1,0) (3,-2);
```



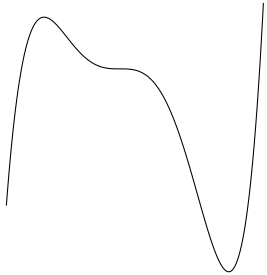
8.4-Sinus-Cosinus

```
\tikz\draw (0,0) sin (1,1) cos (2,0) sin (3,-1) cos (4,0);
```

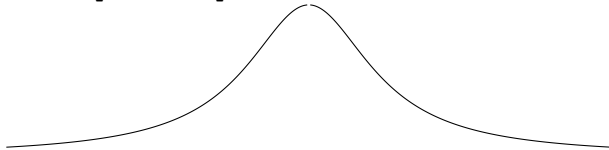


9-Graphe

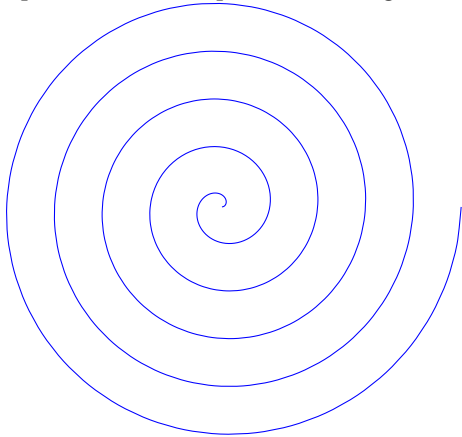
```
\tikz[scale=.5]\draw plot[samples=100, smooth, domain=-3:3.8]
(\x, {.05*(\x+2.6)*(\x-3.7)*\x^3});
```



```
\tikz{\draw plot[samples=100, smooth, domain=.02:4] (\x, {2/(1+\x^2)});
\draw plot[samples=100, smooth, domain=.02:4] (-\x, {2/(1+\x^2)});}
```



```
\tikz[scale=.05]\draw[color=blue,domain=0:10*pi,samples=200,smooth]
plot (canvas polar cs:angle=\x r,radius=\x r);
```



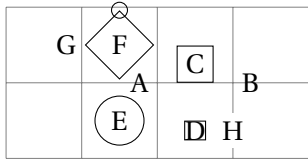
10-Commandes \node et \coordinate

Pour certaines formes,il faut ajouter `\usetikzlibrary{shapes}` dans le préambule :

```
\begin{tikzpicture}
\draw[help lines](-1,0)grid(3,2);
\node[left] (A) at (1,1){$A$};
\coordinate [label=right:$B$] (B) at (2,1);
\node[draw,above] (C) at (1.5,1){$C$};
\node[draw,below,inner sep=0] (D) at (1.5,.5){$D$};
\node[draw,circle] (E) at (.5,.5){$E$};
\node[draw,diamond,label=left:$G$] (F) at (.5,1.5){$F$};
\draw(node cs:name=F,anchor=north) circle (3pt) ;
\node at (B|-D){\colorbox{white}{H}};
```



```
\end{tikzpicture}
```



Avec `\usetikzlibrary{shapes.symbols}`

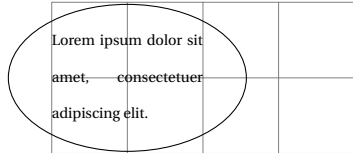
D'autres formes avec de multiples options : `\node` : cloud, forbidden sign, magnifying glass, starburst, signal, tape

```
\begin{tikzpicture}
```

```
\draw[help lines](-1,0)grid(3,2);
```

```
\node[draw,ellipse,text width=2cm,text justified] at (0,1) {\tiny Lorem ipsum dolor sit amet, consectetur adipiscing elit.};
```

```
\end{tikzpicture}
```



11-Relier 2 éléments éloignés dans un texte

```
\tikz[baseline=(A.base),remember picture]\node[inner sep=0pt,draw] (A){Lorem}; ipsum dolor sit amet, consectetur adipiscing elit. Duis eget orci sit amet orci dignissim \tikz[baseline=(B.base),remember picture]
```

```
\node[inner sep=0pt,draw] (B){rutrum.};
```

```
\tikz[overlay,remember picture]\draw (A) to[bend right] (B);
```

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis eget orci sit amet orci dignissim rutrum

Autre exemple :

```
\tikzstyle{every picture}+=[remember picture]
```

```
\[y = \tikz[baseline]{\node[fill=blue!50,anchor=base] (t1){$a$};}x+\tikz[baseline]{\node[fill=red!50,anchor=base] (t2){$b$};}\]
```

```
\tikz\node[draw,circle](n1){}; coefficient directeur
```

```
\tikz[overlay]\draw[blue,->](n1.north)to[out=60,in=135](t1.north west);
```

