

Tegnekurs i TikZ

Veronika Heimsbakk
veronahe@ulrik.uio.no

The Basics

Inkludere pakken:

```
\usepackage{tikz}
```

Opprette miljøet:

```
\begin{tikzpicture}  
    <kode her>  
\end{tikzpicture}
```

The Basics – tegne ei linje



► `\draw (0,0) -- (4,0);`

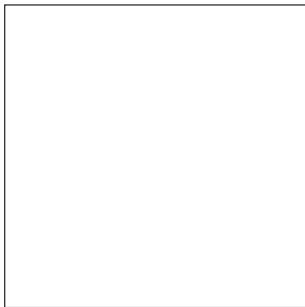


► `\draw (0em,0em) -- (4em,0em);`



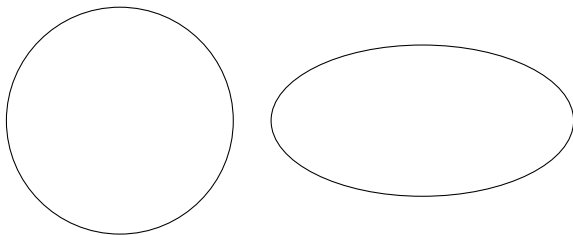
► `\draw (0pt,0pt) -- (4pt,0pt);`

The Basics – kvadrat



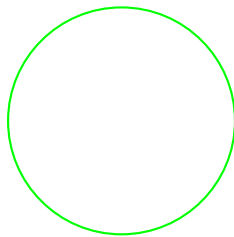
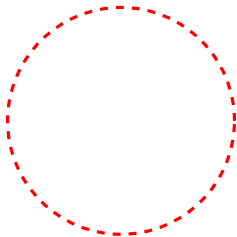
- ▶ `\draw (0,0) -- (4,0) -- (4,4) -- (0,4) -- (0,0);`
- ▶ `\draw (0,0) rectangle (4,4);`

The Basics – sirkel









- ▶ `\draw (2,2) circle (1.5cm);`
- ▶ `\draw (6,2) ellipse (2cm and 1cm);`

The Basics – pynte litt



- ▶ `\draw[red, very thick, dashed] (2,2) circle (1.5cm);`
- ▶ `\draw[green, thick] (6,2) circle (1.5cm);`

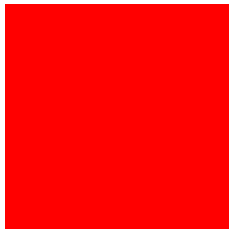
The Basics – tykkelser

	ultra thick
	very thick
	thick
	thin
	very thin
	ultra thin

The Basics – farger

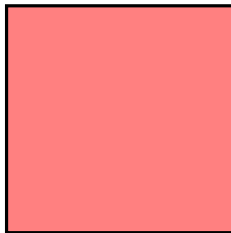


The Basics – fylle med farge



```
\fill[red] (0,0) rectangle (3,3);
```

The Basics – fylle med farge og kant



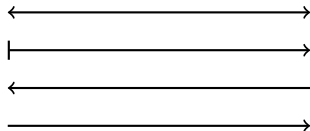
```
\filldraw[red!50, draw=black, very thick] (0,0) rectangle (3,3);
```

The Basics – fylle med gradient



```
\shade[left color=black, right color=red] (0,0) rectangle (2,2);  
\shade[top color=black, bottom color=red] (0,0) rectangle (2,2);  
\shade[inner color=black, outer color=red] (0,0) rectangle (2,2);
```

Piler i TikZ



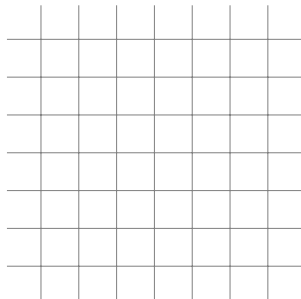
```
\draw[<->] (0,1.5) -- (4,1.5);  
\draw[|->] (0,1) -- (4,1);  
\draw[<-] (0,0.5) -- (4,0.5);  
\draw[->] (0,0) -- (4,0);
```

Plotte funksjoner



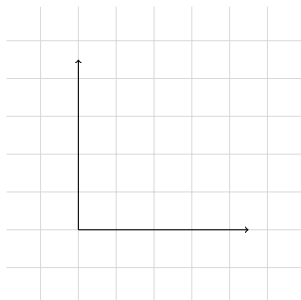
```
\begin{tikzpicture}
  \draw[<->] (0,3.5) -- (0,0) -- (5,0);
  \draw[red, thick, domain=0:1.2] plot (\x, {0.25+\x+\x*\x});
\end{tikzpicture}
```

Rutenett med akser



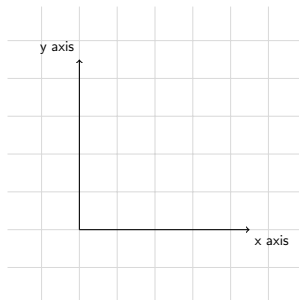
```
\draw[step=1cm,gray,very thin] (-1.9,-1.9) grid (5.9,5.9);
```

Rutenett med akser



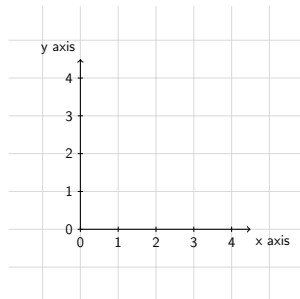
```
\draw[step=1cm,gray!30,very thin] (-1.9,-1.9) grid (5.9,5.9);  
\draw[thick, ->] (0,0) -- (4.5,0);  
\draw[thick, ->] (0,0) -- (0,4.5);
```

Rutenett med akser



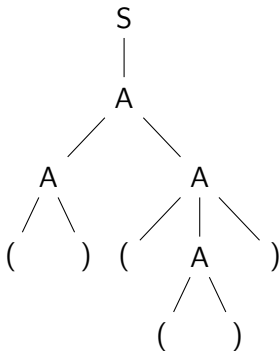
```
\draw[thick, ->] (0,0) -- (4.5,0) node[below right] {x axis};  
\draw[thick, ->] (0,0) -- (0,4.5) node[above left] {y axis};
```


Rutenett med akser



```
\foreach \x in {0,1,2,3,4}
  \draw (\x cm, 2pt) -- (\x cm, -2pt) node[below] {$\x$};
\foreach \y in {0,1,2,3,4}
  \draw (2pt, \y cm) -- (-2pt, \y cm) node[left]  {$\y$};
```

Traer



Noder – fasonger

```
\usetikzpackage{shapes}
```

Plain node

Rectangle

Circle

Ellipse

Circle
split

Forbidden
sign

~~Cross out~~

Polygon

Star

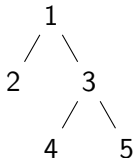
Trær – bygge et tre

Rot-noden:

1

```
\node {1};
```

Bygger videre:

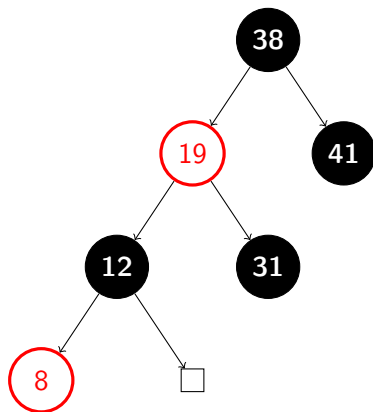


```
\node {1}
  child { node {2} }
  child { node {3}
    child { node {4} }
    child { node {5} }
  }
;
```

Trær

```
\begin{tikzpicture}[every node/.style={},  
                    level 2/.style={sibling distance=20mm},  
                    level 3/.style={sibling distance=10mm},  
                    level distance=30pt]  
  
  \node {S}  
    child { node{A}  
      child { node {A}  
        child { node {() }  
        child { node {}} }  
      }  
      child { node {A}  
        child { node {() }  
        child { node {A}  
          child { node {() }  
          child { node {}} }  
        }  
        child { node {}} }  
      }  
    }  
  ;  
\end{tikzpicture}
```

Rød-svarte træer



Trær

```
\tikzset{
  treenode/.style = {align=center, inner sep=0pt},

  % Sorte noder
  node_black/.style = {treenode, circle, white,
                       font=\bfseries, draw=black,
                       fill=black, text width=0.8cm},

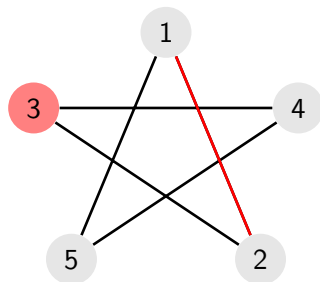
  % Røde noder
  node_red/.style = {treenode, circle, red, draw=red,
                    text width=0.8cm, very thick},

  % Null-pekere
  node_null/.style = {treenode, rectangle, draw=black,
                     minimum width=0.3cm,
                     minimum height=0.3cm}
}
```

Trær

```
\begin{tikzpicture}[->,level/.style={ sibling distance = 2cm,  
                                     level distance = 1.5cm }]  
  
\node [node_black] {38}  
  child {node [node_red] {19}  
    child {node [node_black] {12}  
      child {node [node_red] {8} }  
      child {node [node_null] {} }  
    }  
    child {node [node_black] {31} }  
  }  
  child { node [node_black] {41} }  
;  
\end{tikzpicture}
```


Grafer



- ▶ Noder (vertex)
- ▶ Markerte noder (selected vertex)
- ▶ Kanter (edge)
- ▶ Markerte kanter (selected edge)

Grafer – noder



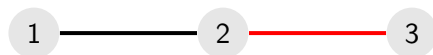
```
\tikzstyle{vertex} = [circle,fill=black!10]
\tikzstyle{selected vertex} = [vertex, fill=red!50]
```

```
% Tegne nodene
```

```
\node[vertex] (v1) at (0,0) {1};
```

```
\node[selected vertex] (v2) at (0.5,0) {2};
```

Grafer – kanter



```
\tikzstyle{selected edge} = [draw,line width=1pt,-,red!100]  
\tikzstyle{edge} = [-,black,line width=1pt]
```

```
% Tegne nodene
```

```
\node[vertex] (v1) at (0,0) {1};
```

```
\node[vertex] (v2) at (0.5,0) {2};
```

```
\node[vertex] (v3) at (1,0) {3};
```

```
% Tegne kantene
```

```
\draw[edge] (v1) -- (v2);
```

```
\draw[selected edge] (v2) -- (v3);
```

Grafer – kanter

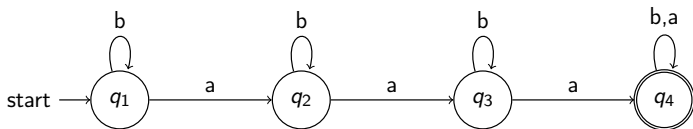
```
\begin{tikzpicture}[scale=5]
  \tikzstyle{vertex}          = [circle,fill=black!10]
  \tikzstyle{selected vertex} = [vertex, fill=red!50]

  \tikzstyle{selected edge}   = [draw,line width=1pt,-,red!100]
  \tikzstyle{edge}            = [-,black,line width=1pt]

  \node[vertex]              (v1) at (1.25,1.7) {1};
  \node[vertex]              (v2) at (1.5,1.1)  {2};
  \node[selected vertex]     (v3) at (0.9,1.5)  {3};
  \node[vertex]              (v4) at (1.6,1.5)  {4};
  \node[vertex]              (v5) at (1,1.1)    {5};

  \draw[edge]                (v1)--(v2)--(v3)--(v4)--(v5)--(v1);
  \draw[selected edge]       (v1)--(v2);
\end{tikzpicture}
```

Automater



Må inkludere `\usetikzlibrary{automata}`.

Automater

```
\begin{tikzpicture}[->,auto,node distance=3cm,line width=0.2mm]
  \node[initial,state] (A) {} {$q_1$};
  \node[state] (B) [right of=A] {} {$q_2$};
  \node[state] (C) [right of=B] {} {$q_3$};
  \node[state,accepting] (D) [right of=C] {} {$q_4$};

  \path (A) edge [loop above] node {b} (A)
        edge node {a} (B)
        (B) edge [loop above] node {b} (B)
        edge node {a} (C)
        (C) edge [loop above] node {b} (C)
        edge node {a} (D)
        (D) edge [loop above] node {b,a} (D);
\end{tikzpicture}
```