FSEM 1111 Computer Security – from a Free Software Perspective

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Topics

- Typesetting Mathematics with LaTeX
- Using XY-pic for graphics
- Including graphics in LaTeX
- Inkscape
- The GIMP
- gnuplot

Math Mode

Start and end math mode with:

- Dollar-sign ($math$)
- Brackets (\[math \])
- Environments (\begin{equation}math\end{equation})

Simple Examples

- $a+b \not= 42$

```
$a+b \not= 42$
```

- $\sin \pi \le 1$

```
$\sin \pi \le 1$
```

- $\frac{a}{b}$

```
$\frac{a}{b}$
```

- $\sqrt{n} := \sqrt[2]{n}$

```
$\sqrt{n} := \sqrt[2]{n}$
```

Equations

$$E = mC^2 \quad (1)$$

```
\begin{equation}
E = mC^2
\end{equation}
```

$$\lim_{n\to\infty}\frac{1}{n}$$

```
\begin{equation*}
 \lim_{n\to\infty}\frac{1}{n}
\end{equation*}
```

$$\prod_{i=0}^{n}\left(i\atop n\right)$$

```
\[
 \prod_{i=0}^n\left(i\atop n\right)
\]
```

More Equations

$$g = b * x + (a \mod b) * y \tag{2}$$
$$= b * (x - (a/b) * y) + a * y \tag{3}$$

Equation (2) uses the definition of g.

```
\begin{align}
 g &= b * x + (a \mod b) * y \label{eq:f} \\
   &= b * (x - (a / b)*y) + a * y
\end{align}
Equation~\eqref{eq:f} uses the definition of $g$.
```

Cases

$$\alpha = \begin{cases} 4 & \texttt{if} \quad \alpha > 0 \\ 0 & \texttt{otherwise} \end{cases} \tag{4}$$

```
\begin{equation}
 \alpha = \begin{cases}
           4 & \texttt{if} \quad \alpha > 0 \\
           0 & \texttt{otherwise}
          \end{cases}
\end{equation}
```

Brackets

$$\Gamma = \left\{ x \left| \sum_{i=0}^{42} \frac{1}{x^i} \leq \gamma \right\} \right. \tag{5}$$

```
\begin{equation}
  \Gamma = \left\{ x \left|
    \sum_{i=0}^{42} \frac{1}{x^i} \le \gamma
          \right.  \right\}
\end{equation}
```

Super and Subscripts

$a^{b^c d_e}_{x_{\frac{1}{2^t}}}$

```
$a^{b^cd_e}_{x_{\frac{1}{2^t}}}$
```

Not everything that you can typeset is going to be readable!

Fractions

$$\frac{1}{1+\frac{1}{1+\frac{1}{n}}}$$

```
\frac{1}{1+\frac{1}{1+\frac{1}{n}}}
```

Logarithms

- $\log n$ `$\log n$`
- $\log_2 n$ `$\log_2 n$`
- $\ln e$ `$\ln e$`
- $\ln^2 e$ `$\ln^2 e$`

Common Symbols

- $\rightarrow$ – "\rightarrow"
- $\Rightarrow$ – "\Rightarrow"
- $\Leftrightarrow$ – "\Leftrightarrow"
- $\overline{a}$ – "\overline{a}"
- $a \cdot b$ – "a \cdot b"

Common Symbols

- $\neg a$ – "\neg a"
- $a \wedge b$ – "a \wedge b"
- $a \vee b$ – "a \vee b"
- $\bigvee_a \equiv \exists_a$ – "\bigvee_a \equiv \exists_a"
- $\bigwedge_a \equiv \forall_a$ – "\bigwedge_a \equiv \forall_a"

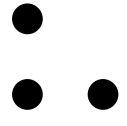
Your textbook lists many more.

XY-pic

- LaTeX package for typesetting *certain* types of figures
- Precise drawing of line-diagrams – much more precise than with a mouse in a GUI
- Links to extensive documentation are on the webpage
- We will just talk about the basics

Using XY-pic

\usepackage[all]{xy}



```
\[
\xy
0;/r1cm/:
(0,0)*{\bullet};
(1,0)*{\bullet};
(0,1)*{\bullet};
\endxy
\]
```

XY-pic Lines and Arrows

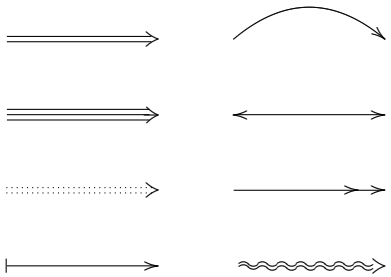
$G \to H$ `{\ar (0,30)*+{G}; (10,30)*+{H}};`

$E - F$ `(0,20)*+{E}; (10,20)*+{F} **\dir{-};`

$C \longrightarrow D$ `{\ar (0,10)*{C}; (10,10)*{D}};`

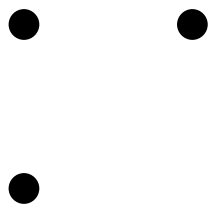
$A \longrightarrow B$ `(0,0)*{A}; (10,0)*{B} **\dir{-};`

Arrow Types



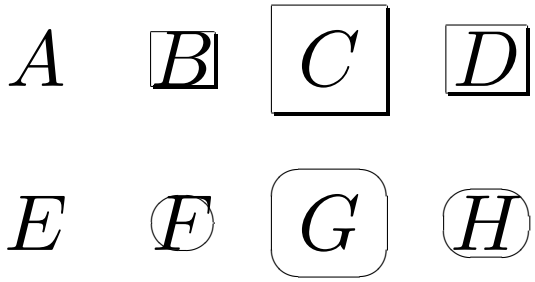
```
\xy
 {\ar@{=>} (0,15)*{}; (10,15)*{}};
 {\ar@3{->} (0,10)*{}; (10,10)*{}};
 {\ar@2{:>} (0,5)*{}; (10,5)*{}};
 {\ar@{|->} (0,0)*{}; (10,0)*{}};
 {\ar@2{~>} (15,0)*{}; (25,0)*{}};
 {\ar@{->>} (15,5)*{}; (25,5)*{}};
 {\ar@{<->} (15,10)*{};(25,10)*{}};
 {\ar@/^1pc/(15,15)*{};(25,15)*{}};
\endxy
```

XY-matrix



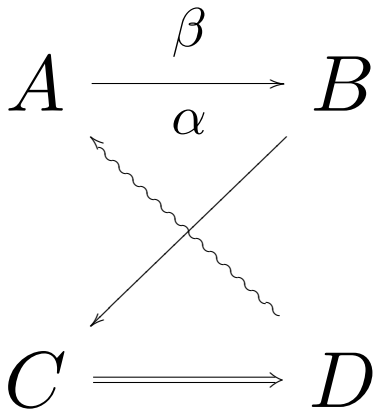
```
\xymatrix@=1cm{
   \bullet & \bullet \\
   \bullet &         \\
}
```

Boxing



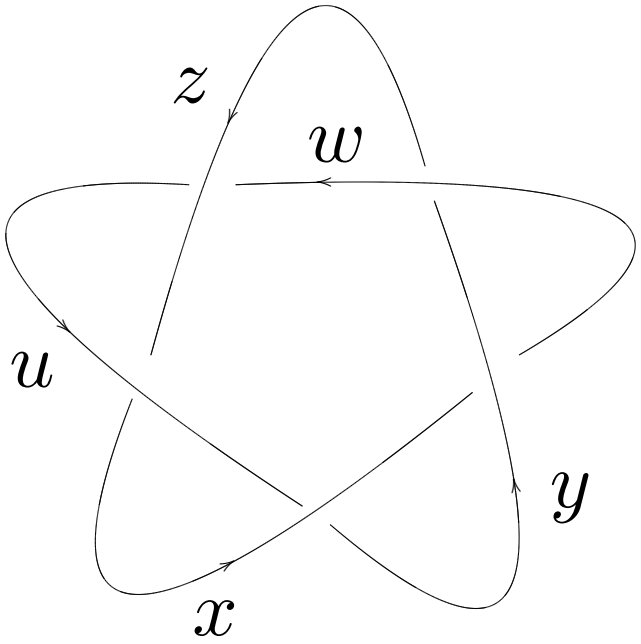
```
\xymatrix@=0.75cm{
   A & *[F-,]{B} &
     *+[F-,]{C} & *+<5pt>[F-,]{D} \\
   E & *[F-:<10pt>]{F}  & \
     *+[F-:<10pt>]{G} & *+<5pt>[F-:<10pt>]{H} \\
}
```

Arrows




```
\xymatrix@=2cm{
   A\ar[r]_{\alpha}^{\beta} & B\ar[dl] \\
   C\ar@{=>}[r] & D\ar@{~>}[ul] \\
}
```

Knots



Including External Graphics

```
\includegraphics{logoDU.jpg}
```

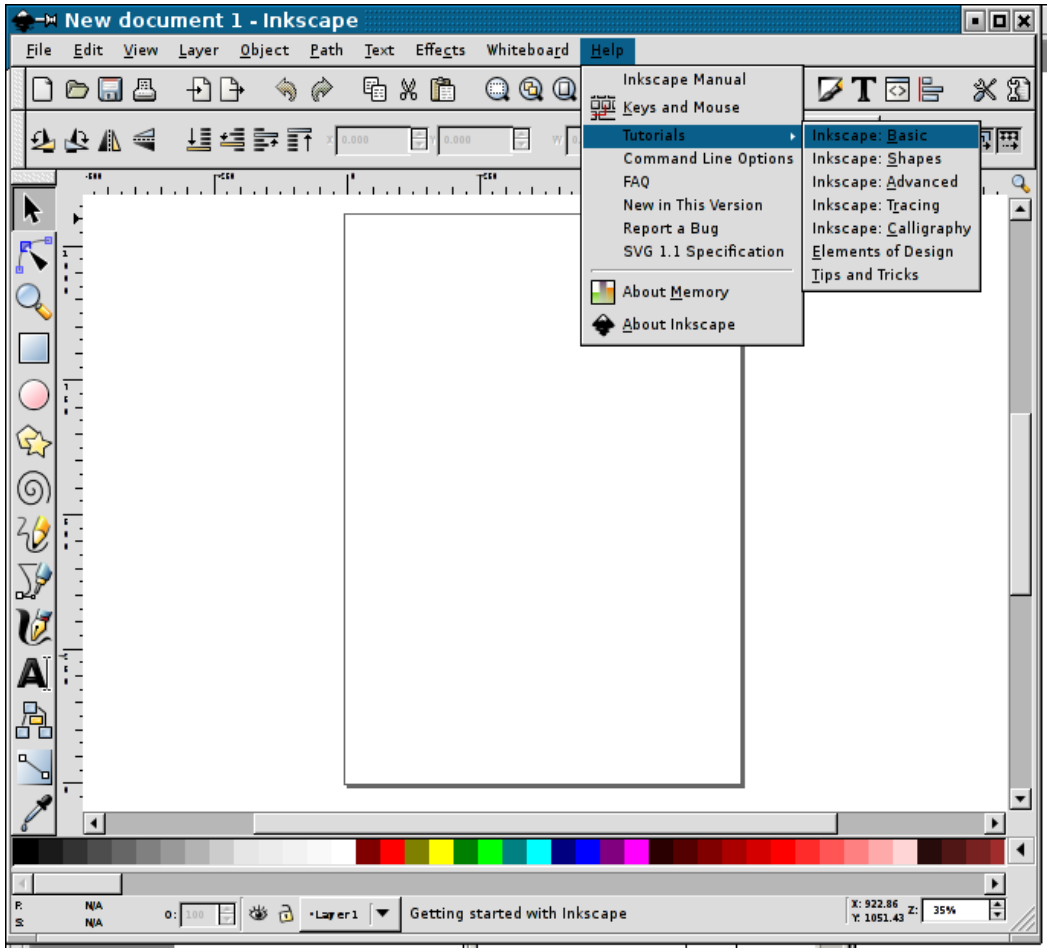
```
\includegraphics[scale=0.5]{logoDU.jpg}
```

```
\includegraphics[angle=45]{logoDU.jpg}
```

```
\includegraphics[angle=175,scale=0.5]{logoDU}
```

Vector Graphics vs Bitmaps

Inkscape


New document 1 - Inkscape
File Edit View Layer Object Path Text Effects Whiteboard Help
Inkscape Manual
Keys and Mouse
Tutorials
Command Line Options
FAQ
New in This Version
Report a Bug
SVG 1.1 Specification
About Memory
About Inkscape
Inkscape: Basic
Inkscape: Shapes
Inkscape: Advanced
Inkscape: Tracing
Inkscape: Calligraphy
Elements of Design
Tips and Tricks
Layer 1
Getting started with Inkscape

Inkscape

- Allows production of vector graphics (svg, eps, pdf)
- Supports layers
- Includes extensive tutorials

$\Rightarrow$ Play around with it!

The GIMP

- The GNU Image Manipulation Program
- Manipulation of bitmaps (xcf, png, jpeg, gif, ...)
- Supports layers and scripting

Script Fu

Scripts describe sequences of common image manipulation operations. Existing scripts can, for example, generate

Other Popular Packages

- ImageMagick (display, convert)
- xfig
- tgif
- ps2pdf (convert (e)ps to pdf)
- pdf2ps (convert pdf to ps)

gnuplot

- Tool for data visualization
- gnuplot produces vector graphics
- Microsoft Excel and OpenOffice can do similar things
- gnuplot can handle much larger data sets
- gnuplot can easily be scripted

gnuplot

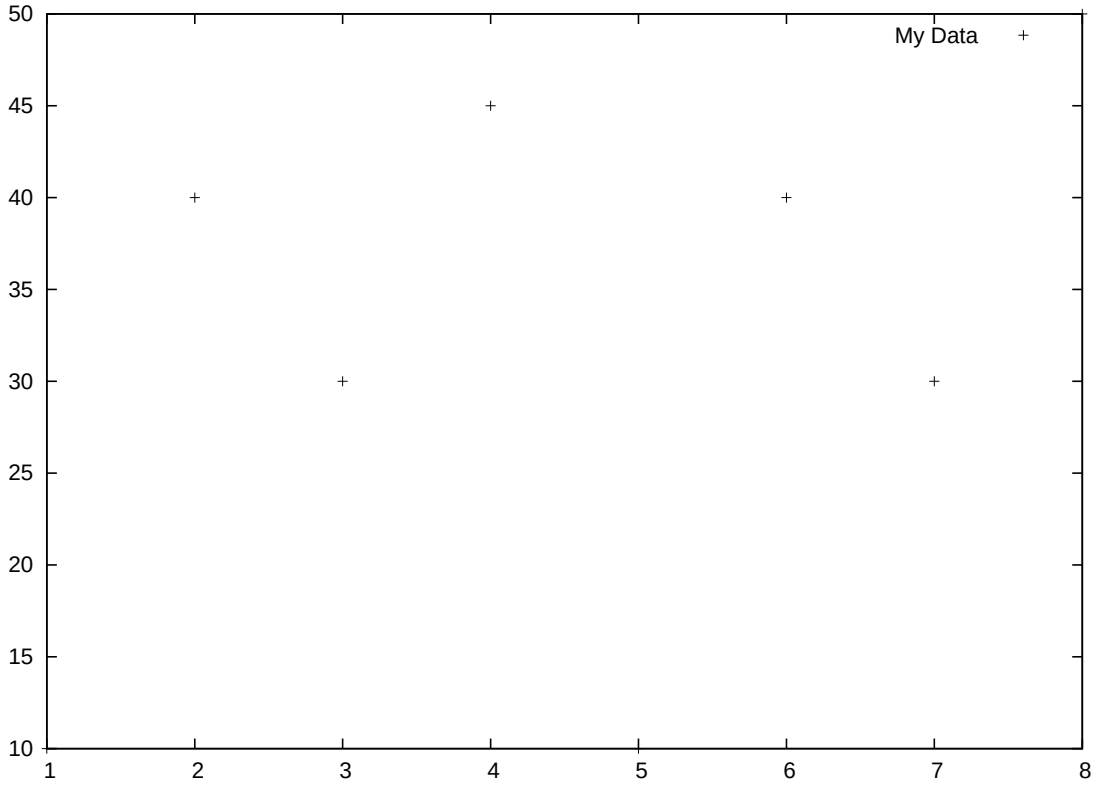
```
#!/bin/sh
gnuplot << EOF
set terminal postscript
set output 'plot.eps'
plot "data.txt" title 'My Data' with points
EOF
```

The Data

The contents of `data.txt` are:

```
1 10
2 40
3 30
4 45
5 10
6 40
7 30
8 50
```

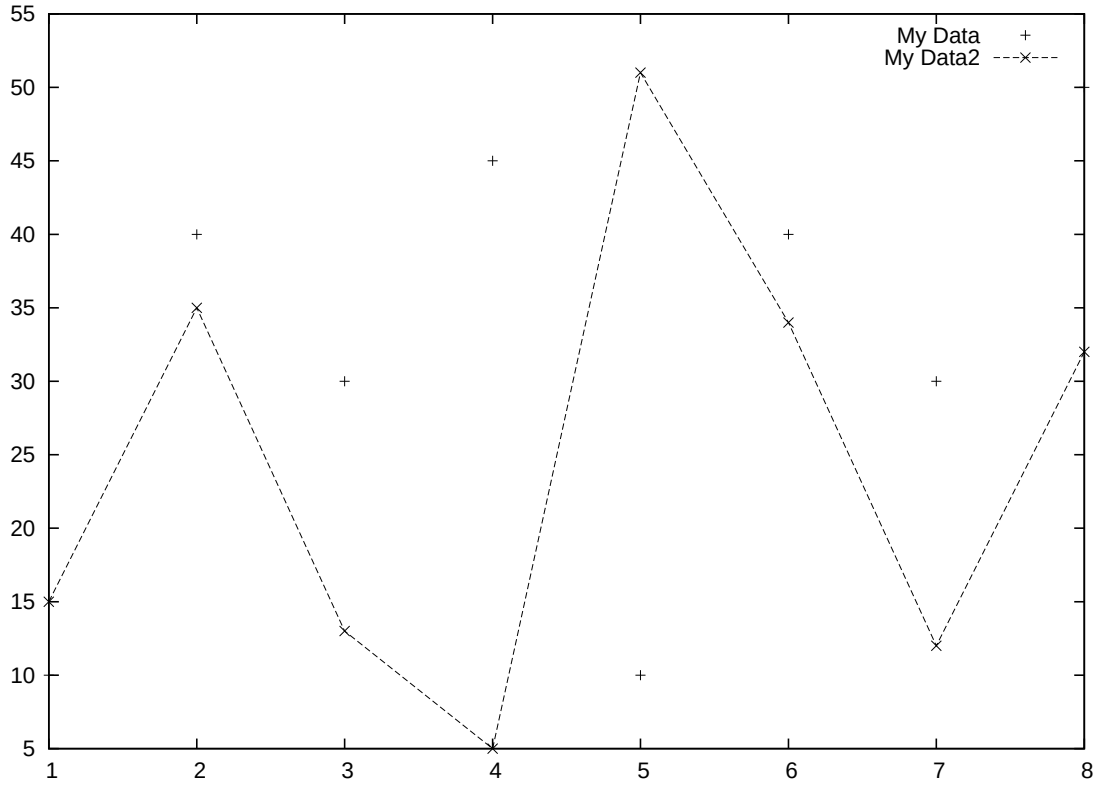
Output



Plotting Multiple Data Points

```
#!/bin/sh
gnuplot << EOF
set terminal postscript
set output 'plot2.eps'
plot "data.txt" title 'My Data' with points, \
     "data2.txt" title 'My Data2' with linespoints
EOF
```

Output



Questions

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