# LATEX Basics

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`www.mathstat.dal.ca/˜wrebecca/latex.html`

# What is LaTeX ?

LaTeX is a mathematical typesetting program. It is primarily used by academics in the sciences. It gives the user a way of easily displaying mathematical formulas and graphics as well as formatting exactly to one's specifications.

MikTeX, Ghostscript/GSview and WinEdt can all be downloaded and installed (at one time) from a .pdf document using proTeXt:
`http:www.tug.org/protext/`

# From the beginning...

```
\documentclass[12pt]{article}
\usepackage{amsmath,amsfonts}

\begin{document}

This is my {\bf document} so far.  Not much to it. We can also make
lists of things:
\begin{enumerate}
\item {\huge HUGE}
\item {\LARGE LARGE}
\item {\Large Large}
\item {\large large}
\item {\small small}
\item {\tiny tiny}
\end{enumerate}

This is my {\it second} paragraph.

\end{document}
```

# Mathematical Equations

```
$ x^3+\cos (\theta)+\sum_{i=1}^n a_n$
```

```
$$ x^3+\cos (\theta)+\sum_{i=1}^n a_n$$
```

```
\[ x^3+\cos (\theta)+\sum_{i=1}^n a_n \]
```

$$x^3 + \cos(\theta) + \sum\nolimits_{i=1}^{n} a_n$$

$$x^3 + \cos(\theta) + \sum_{i=1}^{n} a_n$$

$$x^3 + \cos(\theta) + \sum_{i=1}^{n} a_n$$

We can also write equations that are labelled so that we refer back to them.

```
\begin{equation}
x^3+\cos (\theta)+\sum_{i=1}^n a_n \label{testeqn}
\end{equation}

We can refer to Equation \eqref{testeqn}
```

$$x^3 + \cos(\theta) + \sum_{i=1}^{n} a_n \tag{1}$$

We can refer to Equation (1)

What if we have a group of equations? What if our equation goes over one line?

Here we use `eqnarray` environment.

```
\begin{eqnarray}
f'(x) & = & a x+\cos (x) + \frac{1}{2x}\\
g'(x) & = & b x^2 +\sin (x) +\frac{x}{x^2+1}
\end{eqnarray}
```

$$f'(x) \;=\; ax + \cos(x) + \frac{1}{2x} \qquad (2)$$

$$g'(x) \;=\; bx^2 + \sin(x) + \frac{x}{x^2 + 1} \qquad (3)$$

```
\begin{eqnarray*}
f'(x) & = & a x+\cos (x) + \frac{1}{2x}+ b x^2 \\
& & +\sin (x) +\frac{x}{x^2+1}
\end{eqnarray*}
```

$$f'(x) \;=\; ax + \cos(x) + \frac{1}{2x} + bx^2$$
$$+ \sin(x) + \frac{x}{x^2 + 1}$$

## More Math Help

http://web.ift.uib.no/Fysisk/Teori/KURS/WRK/TeX/symALL.html

# Spacing

Two extremely useful spacing commands are `\vspace` and `\hspace`. The first gives vertical space and the second gives horizontal space. The argument in { } gives the amount of the space.

For example:

`\vspace{2ex}`        `\hspace{2in}`

One use is as follows:

`l\hspace{-0.08cm}R`

to give $\mathbb{R}$

# Spacing in Math Mode

1. \ ;
   - a thick space

2. \ :
   - a medium space

3. \ ,
   - a thin space

4. \ !
   - a negative thin space

# Example:

`$$f(x) = \int_0^2 x^2\sin x dx$$`

$$f(x) = \int_0^2 x^2 \sin x dx$$

`$$f(x) = \int_0^2 x^2\sin x\;dx$$`

$$f(x) = \int_0^2 x^2 \sin x \; dx$$

# Tables

Another useful aspect of LaTeX is making tables.

```
\begin{tabular}{lcr}
column 1 & column 2 & column 3\\
$1.5$ & $2.5$ & $3.5$
\end{tabular}
```

| column 1 | column 2 | column 3 |
|:---|:---:|---:|
| 1.5 | 2.5 | 3.5 |

# Tables, cont'd

We can make the table even fancier as follows:

```
\centering
\begin{tabular}{|l|cr}\hline
column 1 & column 2 & column 3\\
\hline$1.5$ & $2.5$ & $3.5$\\\hline
\end{tabular}
```

| column 1 | column 2 | column 3 |
|----------|:--------:|---------:|
| 1.5      | 2.5      | 3.5      |

# dalthesis.cls

The `dalthesis.cls` is used for your MSc or PhD thesis. It has many of the formatting required by the Faculty of Graduate Studies built in.

You download it into the directory in which your main thesis file will be located and then use it as follows:
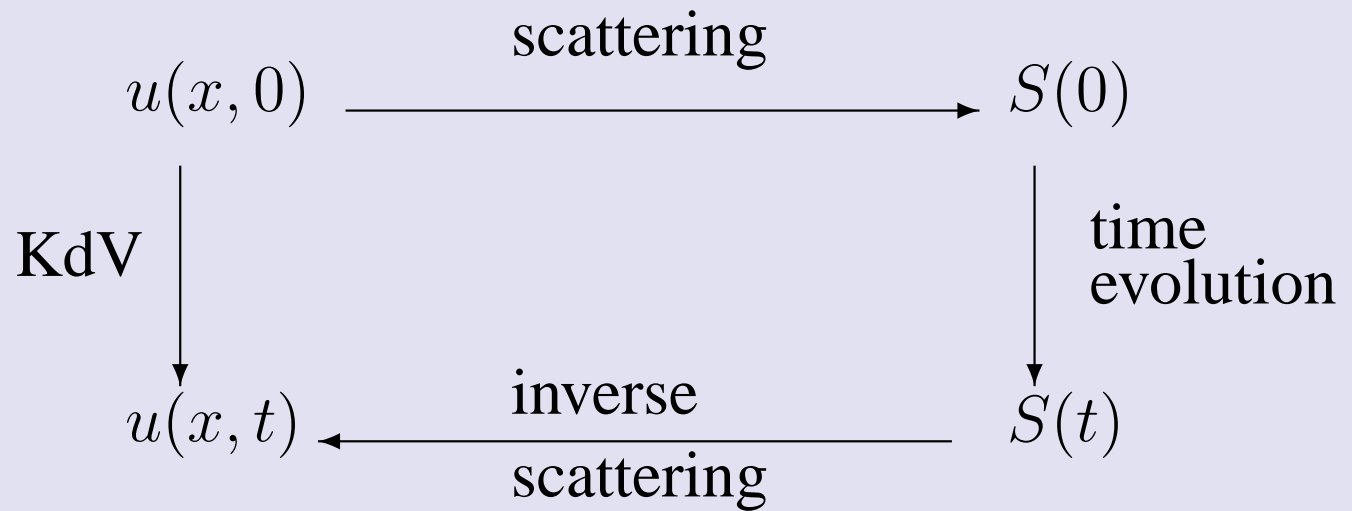
```
\documentclass[12pt]{dalthesis}
```

A sample file for a MSc thesis can be found on my website.

# Scaled Picture

The `scaledpicture` environment is available through the package fullpict.sty.

```
\begin{scaledpicture}{70}(20,10)(0,0)
\put(2,2){$u(x,t)$} \put(2,8){$u(x,0)$} \put(18,2){$S(t)$}
\put(18,8){$S(0)$} \put(6,8){\vector(1,0){11.5}}
\put(3,7){\vector(0,-1){4}}\put(18.5,7){\vector(0,-1){4}}
\put(17,2){\vector(-1,0){11.5}} \put(9,9){scattering}
\put(9,2.5){inverse} \put(9,1){scattering}
\put(0,5){KdV}\put(19.5,5.5){time} \put(19.5,4.5){evolution}
\end{scaledpicture}
```
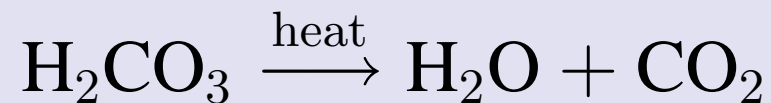
# Example of Scaled Picture

$$u(x,0) \xrightarrow{\text{scattering}} S(0)$$

$$\text{KdV} \downarrow \qquad\qquad \downarrow \text{time evolution}$$

$$u(x,t) \xleftarrow[\text{scattering}]{\text{inverse}} S(t)$$

# Useful Extras

1. `\stackrel`

```
$$\mbox{H}_2\mbox{CO}_3 \stackrel{\rm heat}
{\longrightarrow} \mbox{H}_2\mbox{O} + \mbox{CO}_2$$
```

which gives

$$H_2CO_3 \stackrel{\rm heat}{\longrightarrow} H_2O + CO_2$$

## 2. cases

```
$$f = \begin{cases} 0, & x<0\\
1, & x>0
\end{cases}$$
```

$$f = \begin{cases} 0, & x < 0 \\ 1, & x > 0 \end{cases}$$

## 3. Counters

Sometimes we want to change the counters on our equations or on our lists:

```
\setcounter{enumi}{6}
\setcounter{page}{13}
\setcounter{equation}{4}
```

# Some Resources

`www.mathstat.dal.ca/~wrebecca/latex.html`

`http://www.latex-project.org/`

`http://www.eng.cam.ac.uk/help/tpl/textprocessing/`
`teTeX/latex/latex2e-html/`

`http://www.emerson.emory.edu/services/latex/latex_toc.html`

`http://web.image.ufl.edu/help/latex/`