Math 290: LATEXSeminar Week 5

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Outline

The Tabular Environment

- The tabular environment can be used to create a table in a LaTeXdocument.
- The basic syntax for this environment is:

```
\begin{tabular}{table specifications}

\end{tabular}
```

- The specifications that you provide will determine:
  - The number of columns in your table
  - The way the content of each column is justified: (left [l] , right [r], or centered [c])
  - Whether or not there is a vertical divider between columns.

The Tabular Environment

- For Example, the command

  ```
  \begin{tabular}{| c l || r |}
  ```

  creates a table that has:
  - Three columns
  - The first column is center justified, the second is left justified, and the last is right justified.
  - There is a vertical line to the left of the first column, there is a double vertical line between the second and third columns, and there is a vertical line to the right of the third column.

Creating the Rows of a Table

The syntax for filling in a row of a table is as follows:

- Type the content for the each cell in the table, with an & between each entry.
- Tell the environment to end the row by inputting two slashes: \\
- Warning: The compiler gets mad if a row has too many column entries or if you forget to tell it to end the row!
- Note: `\hline` command is used to place a horizontal line between two rows.
- Inputting `\hline \hline` places a double horizontal line between two rows.

Example:

Open TeXnicCenter and begin a new file. Use the article class, and be sure to call the packages: amssymb and amsmath.
Type in the

```
\begin{document} and \end{document}
```

commands, and then enter the following:

```
\begin{tabular}{|cl||r|}

\hline

$x$ & $y$ & $z$ \\

\hline \hline

$15$ & $27$ & $12$ \\

\hline

\end{tabular}
```

Example:

The resulting table should look as follows:

x	y	z
15	27	12

Now try to create the following tables in your sample file:

x	y	$f(x,y)$
1	0	14
0	1	-12
1	1	2

a	b	c	d
4	16	11	12
x	y	z	w

Note:

- It may occur to you to ask how I was able to get two tables printed side by side in the previous slide.
- To do this, I first created a 2-column table with no boundary lines.
- Then, I put the first table into the first entry of the first row of the outer table and I put the second table as the second entry in the first row of the outer table.
- I also added a horizontal spacing command within the table to position the tables where I wanted them.
- In short, one can create "nested tables" (tables within tables)

The code for this is as follows:

Nested Tables:

```
 \begin{tabular}{c c} \begin{tabular}{c|c|c}
$x$ & $y$ & $f(x,y)$ \\
\hline
$1$ & $0$ & $14$ \\
$0$ & $1$ & $-12$ \\
$1$ & $1$ & $2$ \\
\hline \hline
\end{tabular}
& \hspace{1.5in}
\begin{tabular}{|c|rl||c|}
\hline
$a$ & $b$ & $c$ & $d$ \\
\hline
$4$ & $16$ & $11$ & $12$ \\
\hline \hline
$x$ & $y$ & $z$ & $w$ \\
\hline
\end{tabular} \\ \end{tabular}
```

Outline

Spacing within a Table:

- Spacing objects within a table can be tricky.
- All of the standard manual spacing commands can be used within a table.
- For example:

  `\vspace{}, \hspace{}, \, \. \! and \phantom{}`

  all work within a table.
- However, vertical spacing does not interact well with column dividers, and using manual spacing is tough to get right – especially if you want to leave blank space in a table.
- One nice way to get around some of these difficulties is to use the minipage command. The syntax is as follows:

```
\begin{minipage}{width}
 content
\end{minipage}
```

Minipage:

- The minipage command creates a textbox of precisely the width you input.
- The length of the box is determined by the amount of text that you enter in the box.
- For example, try the following:

```
 \begin{tabular}{c c}
\begin{minipage}{1.0in}
This is a minipage text box inside of a table. \end{minipage}
& \begin{minipage}{1.75in}
I decided to make the box on the right a bit wider than
the one on the left.
\end{minipage}\\
\end{tabular}
```

This should give you the following:

This is a mini-page text box in-side of a table	I decided to make the box on the right a bit wider than the one on the left.

Minipage:

Now spend a little time playing with the width of your minipage boxes. You can also try adding vertical and horizontal boundary lines. See if you can get something like this:

This is a minipage text box inside of a table	I decided to make the box on the right a bit wider than the one on the left.

Outline

Arrays:

- The array environment is similar to the tabular environment in both its uses and its syntax.
- The main difference between the two is that an array is used within the math environment (i.e. within $s), while tabular is not a math command.
- Try inputting the following array:

```
$\mathbf{X} = \left(
\begin{array}{cc|c}
a & b & c \\
d & e & f \\
\vdots & \vdots & \vdots
\end{array} \right)$
```

This should give you the following: $\mathbf{X} = \left(\begin{array}{cc|c} a & b & c \\ d & e & f \\ \vdots & \vdots & \vdots \end{array} \right)$

Piecewise Defined Functions:

- The array environment can also be used to define a piecewise defined function:
- Try the following example:

```
$|x| = \left\{
\begin{array}{rl}
-x & \text{if } x < 0,\\
0 & \text{if } x = 0,\\
x & \text{if } x > 0.
\end{array} \right.$
```

This should give you the following:

$$|x| = \left\{ \begin{array}{rl} -x & \text{if } x < 0, \\ 0 & \text{if } x = 0, \\ x & \text{if } x > 0. \end{array} \right.$$

Matrices:

- Since many areas of mathematics make use of matrices, there are some special commands that are part of the AMS packages that allow us to quickly create matrices in LaTeX.
  Here is one nice way to insert a matrix into a LaTeXdocument:

- OK, bad joke (we'll teach you how to insert graphics like this into documents later in the semester).

Matrices:

- More seriously, some specialized commands for inserting matrices are the commands:
    - pmatrix (which creates a matrix with parentheses () as its delimiters)
    - bmatrix (which creates a matrix with brackets [] as its delimiters)
    - Bmatrix (which creates a matrix with braces {} as its delimiters)
    - vmatrix (which creates a matrix with vertical bars || as its delimiters)
    - Vmatrix (which creates a matrix with double vertical bars |||| as its delimiters)
    - smallmatrix (which creates a matrix approximately the same height as a standard line of text)
- Example: Try inputing the following:

```
$\begin{bmatrix} a & b \\ c & d \\ \end{bmatrix}$
```

Matrices:

- Then try these:

```
$\begin{vmatrix} a & b \\ c & d \\ \end{vmatrix}$
$\begin{Vmatrix} a & b \\ c & d \\ \end{Vmatrix}$
```

- The resulting matrices should look as follows:

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \qquad \begin{vmatrix} a & b \\ c & d \end{vmatrix} \qquad \begin{Vmatrix} a & b \\ c & d \end{Vmatrix}$$

- Try using the smallmatrix command to insert $\bigl(\begin{smallmatrix} a & b \\ c & d \end{smallmatrix}\bigr)$ into a line of text.
- Well, the syntax is not so easy, so here it is:

```
 $\bigl(\begin{smallmatrix}
a & b \\ c & d \\
\end{smallmatrix}\bigr)$
```

Outline

Practice Debugging LaTeXcode:

- One thing that you will notice as you work with LaTeX is that when you are utilizing things like tables, arrays, nested arrays, nested fractions, and delimiters, small mistakes can lead to LOTS of errors.
- To give you a little practice in fixing the sort of errors that arise, I have prepared a sample document that will not compile until several key errors are fixed.
- The file can be found on the handouts page of our course website: http://www.mnstate.edu/jamesju/Spr2011/Content/M290Handouts.html
- Download the file and try compiling it.
- Then debug it.
- Email the corrected .tex file along with your normal lab assignment for this week (use a separate file).