

L^AT_EX– Week 5

1 Arrays

There are several types of array-like things that you can do with L^AT_EX. Some of them can only be used in math mode and others can be used anywhere.

1.1 The array environment

In math mode, one can type

```
$$\begin{array}{clr}
5 & & 7 & & 3 \\
\sin(\theta) & & x+1-x^2 & & 5y^2+14 \\
\end{array}$$
```

Notice that I put dollar signs before and after the array, so that every entry of the array is already in math mode. The `{clr}` tells me that there are 3 columns in my array and that the first column is centered, the second is left-justified, and the third is right-justified. The `&` is used to separate the items in each row, and the `\\` signals the end of the row. Here is the output:

5	7	3
$\sin(\theta)$	$x + 1 - x^2$	$5y^2 + 14$

If you want to put parentheses or brackets around your array, you use the commands `\left[...\right]` or `\left(...\right)`, etc. A list of delimiters is in the extras section at the end of this handout. The left and right command will automatically size the parentheses to be as tall as the array. For example,

```
$$\left[
\begin{array}{clr}
5 & & 7 & & 3 \\
\sin(\theta) & & x+1-x^2 & & 5y^2+14 \\
\end{array}
\right]$$
```

5	7	3
$\sin(\theta)$	$x + 1 - x^2$	$5y^2 + 14$

1.2 The eqnarray environment

A sequence of equations or inequalities is typed with the `eqnarray` or the `eqnarray*` environment. When you type the `\begin{eqnarray}` command, it automatically goes into math mode, so you don't need the dollar sign. `eqnarray` basically sets up an array with 3 columns, with the idea being that the middle column is for the $=$ or \leq or whatever relational symbol you are using.

For example,

```
\begin{eqnarray}
5x+1 & \leq & 7x-3 \\
-2x + 1 & \leq & -3 \quad \nonumber \\
-2x & \leq & -4 \\
x & \geq & 2\label{answer}
\end{eqnarray}
```

Equation (`\ref{answer}`) is the answer to the exercise.

$$5x + 1 \leq 7x - 3 \tag{1}$$

$$-2x + 1 \leq -3 \tag{2}$$

$$-2x \leq -4 \tag{2}$$

$$x \geq 2 \tag{3}$$

Equation (3) is the answer to the exercise.

Since I wanted to refer to the last equation, I used `\label` to give it a name and then `\ref` to refer to it later.

The command `eqnarray` will number every equation in the array, unless you write `\nonumber` at the end of that line. If you don't want any of them to be numbered, you use the command `eqnarray*` instead.

The following example has no equation numbers, so we use `eqnarray*`. Also, we want to write some English text on the third line. Since the `eqnarray` automatically puts us in math mode, we can put `\textnormal{ }` around any English words:

```
\begin{eqnarray*}
|f(x)-f(a)| & = & |x^2-a^2| \\
& \textnormal{ } & \\
& \textnormal{ } &
\end{eqnarray*}
```

```

& = & |x-a||x+a| \\
& < & \delta |x+a|, \textnormal{ since } |x-a|<\delta \\
& < & 2a \delta \\
& < & \varepsilon
\end{eqnarray*}

```

$$\begin{aligned}
|f(x) - f(a)| &= |x^2 - a^2| \\
&= |x - a||x + a| \\
&< \delta|x + a|, \text{ since } |x - a| < \delta \\
&< 2a\delta \\
&< \varepsilon
\end{aligned}$$

2 Exercises

Exercise 5.1: Type the following:

$$T = \left\{ \begin{bmatrix} a & b \\ c & d \end{bmatrix} : ad = bc \right\}$$

Exercise 5.2: Reproduce the following¹:

We define the **absolute value** of a complex number $\alpha = a + bi$ to be

$$|\alpha| = \sqrt{a^2 + b^2}.$$

The absolute value satisfies properties analogous to those satisfied by the absolute value of real numbers:

$$\begin{aligned}
|\alpha| &\geq 0 \text{ and } = 0 \text{ if and only if } \alpha = 0 \\
|\alpha\beta| &= |\alpha||\beta| \\
|\alpha + \beta| &\leq |\alpha| + |\beta|.
\end{aligned}$$

¹From Serge Lang's *Undergraduate Analysis*

3 Extras

3.1 Delimiters

Here is a list of common delimiters:

Name	Delimiter	How to type it in Latex
Parentheses	$(...)$	<code>(...)</code>
Square Brackets	$[...]$	<code>[...]</code>
Braces	$\{...\}$	<code>\{...\}</code>
Angle Brackets	$\langle...\rangle$	<code>\langle ... \rangle</code>
Bars	$... $	<code> ... </code>
Double Bars	$... $	<code> ... </code>