1. Some Random TEX Sites

- A showcase of fancy TEX
- A Directory Structure for TEX Files
- A useful guide for XY-pic

2. BibTeX

To use a bibliography, you must include

```
\bibliographystyle{amsplain}
\bibliography{sampartb}
```

Here, `sampartb` is the name of the bibliography file that you have already created "`sampartb.tex`" and `amsplain` is the particular style of bibliography that you want to use. Once you have typed your bibliography (copied and pasted from mathscinet), you can cite various sources by using the command `\cite{gM68}` or `\cite{sF90}`. Here, the names can be changed to whatever you want them to be to remember them. In your bibliography file you should have the following content

```
@BOOK{gM68,
  author = "George A. Menuhin",
  title = "Universal Algebra",
  publisher = "D. ~van Nostrand",
  address = "Princeton",
  year = 1968,
}

@PHDTHESIS{sF90,
  author = "Soo-Key Foo",
  title = "Lattice Constructions",
  school = "University of Winnebago",
  address = "Winnebago, MN",
  year = 1990,
  month = dec,
}
```

Once you have all of this, the name of the game is to typeset the `sampartb.tex` document, then run BibTeX on `sampartb.aux`. Then typeset the document `sampartb.tex` twice.

3. XY-pic for Commutative Diagrams

To begin, I always include `\usepackage[all]{xy}` in the top matter of my document in order to have any drawings of commutative diagrams. Then whereever I wish to include my picture (usually I'll do it in display math mode), I'll type the following:

```
$$
\xymatrix{

}
$$
```

Like the name implies, this will set up a matrix structure of some sort, however, you need to have something in between the brackets or TeX will get mad. Just as in the matrix environment or tabular environment, "columns" are specified by placing an & in between them and new rows are specified by `\\`. Thus, the following examples will create a "grid" that is 3×5 and 4×2, respectively:

```
$$
```

```
\xymatrix{
 & & & & \\
 & & & & \\
 & & & &
}
$$

$$
\xymatrix{
 & \\
 & \\
 & \\
 &
}
$$
```

For instance, if we place the letters A through O in the 3×5 version, we get the following grid with letters at each place:

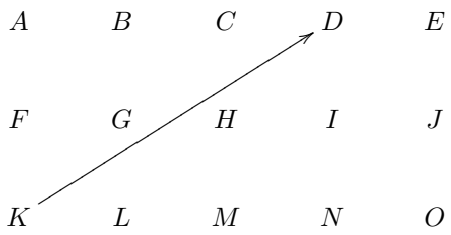
$$\begin{array}{ccccc} A & B & C & D & E \\ F & G & H & I & J \\ K & L & M & N & O \end{array}$$

But what's a commutative diagram without arrows? The simplest arrow is given by the command `\ar[`*dir*`]` where *dir* is a direction that you give such as one of the following:

dir	Direction
u	up 1
d	down 1
l	left 1
r	right 1
ur	up 1 and right 1
dr	down 1 and right 1
ul	up 1 and left 1
dl	down 1 and left 1
urr	up 1 and right 2
dll	down 1 and left 2
⋮	⋮
uurrr	up 2 and right 3
	Etc.

In each case, the base of the arrow starts in the grid box where you have the "`\ar`" command and ends however many grid places up, down, left or right that you have specified. For instance, placing `\ar[uurrr]` inside the grid where the letter K is placed will draw an arrow from the place where K is to the place where D is, as

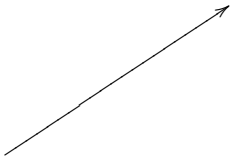
seen below:



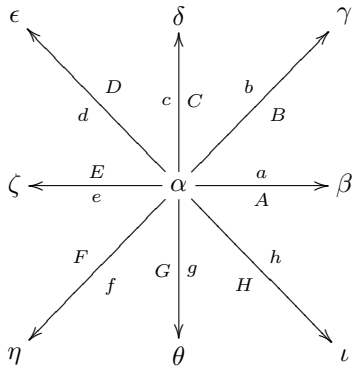
This was typeset by

```
$$
\xymatrix{
A&B&C&D&E\\
F&G&H&I&J\\
K\ar[uurrr]&L&M&N&O
}
$$
```

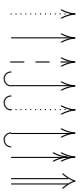
One thing to note is that we don't need each of these boxes filled with anything. For instance, if I take the last example and just remove each of the letters A through O, I still get the same picture (just without any of the letters there)



Often times we would like to put a name on the arrows. To do this, we place a superscript (as we would anywhere else) to put the name on the left side of the arrow. Similarly, a subscript places the name to the right of the arrow. For instance, we'll place the names a through h as a superscript of each of the arrows in the cardinal directions and the capitalized version as a subscript.



Next, we can change the tip of the arrow via the following commands.[1] We illustrate this with the following diagram and how it was typeset:



```
$$
\xymatrix@R=3pt{
\ar@{.>}[r]&\\
\ar@{->}[r]&\\
\ar@{--}[r]&\\
\ar@{^{(}->}[r]&\\
\ar@{^{(}.>}[r]&\\
\ar@{_{(}->}[r]&\\
\ar@{->>}[r]&\\
\ar@{=>}[r]&
}
$$
```

Finally, we can curve arrows by using the command `\ar@/^`*dist*`/[`*dir*`]` or `\ar@/_`*dist*`/[`*dir*`]`. The *dist* argument is a distance such as *r*`pt` (where *r* is a reasonable decimal number) or something like *r*`in`. The first of the two commands for such an arrow uses a superscript and so pushes the arrow to the left of the arrows direction and the second uses a subscript and pushes the arrow toward its right. For example, the following uses the superscript version by 5 points.

$$A \overset{\alpha}{\curvearrowright} B$$

This was typeset by

```
$$
\xymatrix{
A\ar@/^5pt/[r]^{\alpha}&B
}
$$
```

To translate an arrow to its left or to its right by a certain distance, one types `@<5pt>` or `@<-5pt>` to translate the arrow to its left or right (positive or negative version, respectively). The following example uses the positive version for f and the negative version for g and nothing on the leftward arrow.

$$A \underset{g}{\overset{f}{\rightleftarrows}} B$$

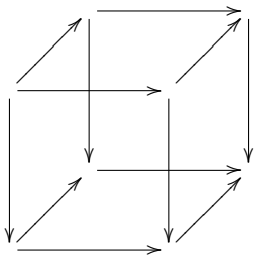
[1] More commands can be found in the XY-pic document hyperlinked to at the beginning of this document.

3.1. **Problems.** Typeset the following diagrams.

(1)

$$\cdots \longrightarrow \mathbb{Z}_4 \xrightarrow{2} \mathbb{Z}_4 \xrightarrow{2} \cdots \longrightarrow \mathbb{Z}_4 \xrightarrow{2} \mathbb{Z}_2 \longrightarrow 0$$

(2)



(3)