LaTeXWorkshop
Worksheet 1

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Goal

The main goal of this worksheet is for you to learn the tools necessary to create a basic document. You can use the bare bones of this file and modify its parts. We will work through

 (i) Setting the title and author

 (ii) Making lists

(iii) Writing math with special fonts, characters and symbols

(iv) Stating and proving theorems

 (v) Including graphs

(vi) Learn to identify some of the most common errors

1   Make it your own

Step 1: Let's start with something easy: identify the title and author of this document and change them to something more appropriate. If you need special characters for your name, check this list.

Step 2: Scroll down to the `START HERE!!!` comment and start writing the main body of your document.

Use the `enumerate` environment. If you type something like this:

```
\begin{enumerate}
    \item First question
    \begin{enumerate}
        \item First part
        \item Second part
    \end{enumerate}
    \item Second question
    \item Third question
\end{enumerate}
```

The output is:

(a) First item

    i. First part

    ii. Second part

(b) Second item

(c) Third item

Bonus: Try finding an example in this document of an enumerated list that uses different labels from the default arabic numerals. How is this accomplished in the code?

Step 3: To write in math mode, you can use $ signs. Typing in-line `$f(x)$` produces the output $f(x)$. In math mode, you will have access to Greek letters, logic symbols, functions, math symbols, and special fonts. Many of the names are intuitive and the commands are often simply the words you would expect preceded by a \, as is the case with

- $\{x \in \mathbb{R} | x$ is a multiple of $\sqrt{2}\}$
- α, β, γ and most Greek letters *Bonus: Try to figure out how to type capital Greek letters, like gamma, chi, or psi.*
- $\forall, \exists, \implies, \in, \ni, \subset$ and other logic symbols
- $\sin, \cos, \log, \lim$ and other functions/operators

Note that you can also use subscripts (x_i) and superscripts (x^n) in a natural way. To write equations that are centered in the page, instead of being part of a paragraph, there are a number of options:

- For a quick line of math, try

```
\[f(x)  =  x^2-5x+6\]
```

$$f(x) = x^2 - 5x + 6$$
$$f(x) = x^2 - 5x + 6$$

- For equations that span several lines of text, try

```
\begin{align}
f(x)  &=  x^2-5x+6\\
&=  (x-2)(x-3)
\end{align}
```

$$
\begin{align}
f(x) &= x^2 - 5x + 6 \tag{1}\\
&= (x-2)(x-3) \tag{2}
\end{align}
$$

Note that these do not require the use of `$` and that `align` automatically numbers equations. If you would like to remove this feature, use `align*` (try adding the asterisk on anything you'd like to remain unnumbered, like sections, chapters, etc.). *Bonus: What do you think are the functions of `&` and `\\`?*

When in doubt, Detexify is a great tool to find the symbol you need. The cheat is to use Mathpix. Try typesetting the equations in the image below:

$$f(x) = x^2 \sin(x)$$
$$\phi(x) = 2x^2 - 6x$$

Remember to use the math environment. Bonus points if you can get the equals signs to align like they are in the picture.

Step 4: Note that the `enumerate` environments can be nested. Create a nested list with at least two levels. The nesting can be done with either `enumerate` or `itemize`, they both have default formatting for each level.

Step 5: Some features are a bit less straightforward, but still easy to understand and remember. For example,

3

```
\[\infty \ \sqrt{x} \ \ni \ \not \exists \ \frac
   {1}{2} \ \int \ \partial\]
\begin{align*}
   f(x) &=
   \begin{cases}
       1-x & x \leq 0\\
       x^2+1 & x >0
   \end{cases}
\end{align*}
```

$$\infty \ \sqrt{x} \ni \not\exists \ \frac{1}{2} \int \partial$$

$$f(x) = \begin{cases} 1 - x & x \leq 0 \\ x^2 + 1 & x > 0 \end{cases}$$

Note that spaces in math mode are only used to separate functions and symbols to avoid ambiguity (i.e. LATEXwill recognize αx as αx but not \alphax). *What do you think \ is used for?*

Step 6: In the preamble, we included the `amsmath` package and created a command for theorems. Use the `thm` (short for theorem) to type a theorem. You can use the example below.

```
\begin{thm}[The name of the theorem could go here]
    The statement of the theorem can go here.
\end{thm}

\begin{proof}
    The proof of the theorem can go here.
\end{proof}
```

Theorem 1 (The name of the theorem could go here). *The statement of the theorem can go here.*

Proof. The proof of the theorem can go here. □

Step 7: LATEXallows you to include graphics in your documents. There are many ways to do so, but the simplest may well be to simply upload an image file and then insert it. We have already included an image in this document. Find the command to use as an example, and include the `ivt.png` image somewhere in the document.

2 Troubleshooting

When (not IF) you get an error, you will need to familiarize yourself with some of the more common errors. You can usually do a web search with key words from the error code to find an explanation/solution. For now, we invite you to read through examples of typical errors. They will come in handy in the future. *We have a lot of packages in this document, and we didn't use all of them. They all have comments indicating what they are for. Remove as many as you can without generating errors.*

3 A more interesting project

Thank you for attending our LaTeX workshop! We are looking forward to your feedback, and if you'd like some of ours, just reach out.

1. The first item in the list

2. The second item

   (a) subitem 1

       i. subsubitem 1