Typesetting Beautiful Math with LaTeX

David Hornbeck & Dr. Chuck Garner

Rockdale Magnet School for Science & Technology

October 19, 2023

Outline

What LaTeX is

LaTeX is a free typesetting program that was developed in 1978. It is the professional standard for nearly all mathematics publishing, as well as publications in computer science, physics, linguistics, etc.

What LaTeX is for

LaTeX is used to typeset textbooks, articles, tests, resumés, and more.

How is LaTeX different than Word?

- In Word, WYSIWYG; in LaTeX, WYSIWYW
- Word is an application that *processes*; LaTeX is a program that *compiles* what you input
- LaTeX gives you control over *everything* in your document - including graphics, figure placement, margins, color schemes, commands, etc.

Examples (Input)


```
\begin{enumerate}[label=\arabic*.]

  \item In $\Delta ABC$, $AB = 3$, $BC = 4$, and $m\angle B = 90^{\circ}$.
      Compute the length of $\overline{AC}$.

  \item $\int\frac{x}{x^2-1}\ dx=\frac{1}{2}\ln(x^2-1)+C$

  \item Compute $\displaystyle \lim_{x\rightarrow \infty}
      \frac{3x^2 - 5x + 2}{\sqrt{16x^4 + 3x -4}}$.

\end{enumerate}
```

Example (Compiled)

1. In ΔABC, $AB = 3$, $BC = 4$, and $m\angle B = 90°$. Compute the length of $\overline{AC}$.

2. $$\int \frac{x}{x^2 - 1}\, dx = \frac{1}{2}\ln(x^2 - 1) + C$$

3. Compute $\lim_{x \to \infty} \dfrac{3x^2 - 5x + 2}{\sqrt{16x^4 + 3x - 4}}$.

Consistency

LaTeX takes care of all numbering - for sections, subsections, lists, and so on, for you. For example:

```
\textbf{\ul{Reasons \LaTeX is the best}}:
\begin{enumerate}[label=\arabic*.]
  \item It's customizable.
  \item It looks great. \setcounter{enumi}{99} \\
  \hspace{5pt} \vdots
  \item It makes file sizes much smaller.
\end{enumerate}
```

Consistency

Reasons LaTeX is the best:

1. It's customizable.
2. It looks great.

   ⋮

100. It makes file sizes much smaller.

Operational Simplicity

LaTeX generates PDFs that are substantially smaller than Word documents.

Example:

- 238 pages of statistics notes in Word →

Operational Simplicity

LaTeX generates PDFs that are substantially smaller than Word documents.

Example:

- 238 pages of statistics notes in Word $\rightarrow$ 11.1 MB

Operational Simplicity

LaTeX generates PDFs that are substantially smaller than Word documents.

Example:

- 238 pages of statistics notes in Word → 11.1 MB
- 125 pages of statistics notes in LaTeX→

Operational Simplicity

LaTeX generates PDFs that are substantially smaller than Word documents.

Example:

- 238 pages of statistics notes in Word → 11.1 MB
- 125 pages of statistics notes in LaTeX→ 0.77 MB

Operational Simplicity

LaTeX is system-independent: it will generate PDFs that read the same on any device and any operating system. Your file will still work in 20 years!

Operational Simplicity

LaTeX is system-independent: it will generate PDFs that read the same on any device and any operating system. Your file will still work in 20 years!

LaTeX also comes with many templates (exams, articles, books) that take care of many of the more specific or complex aspects of creating a document.

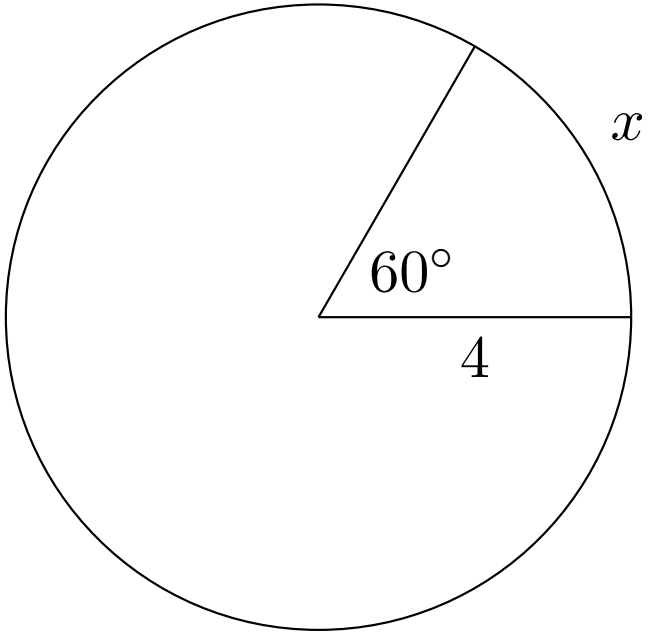
Power: Graphing

In LaTeX, you can create diagrams for test questions or activities.

```
\begin{tikzpicture}
    \draw (0,0) circle (2);
    \draw (0,0) -- (2,0) node[midway,below] {4};
    \draw (0,0) -- (60:2);
    \draw (0.6, 0.3) node {$60^{\circ}$};
    \draw (30:2) node[above right] {$x$};
\end{tikzpicture}
```

Power: Graphing

Like this!



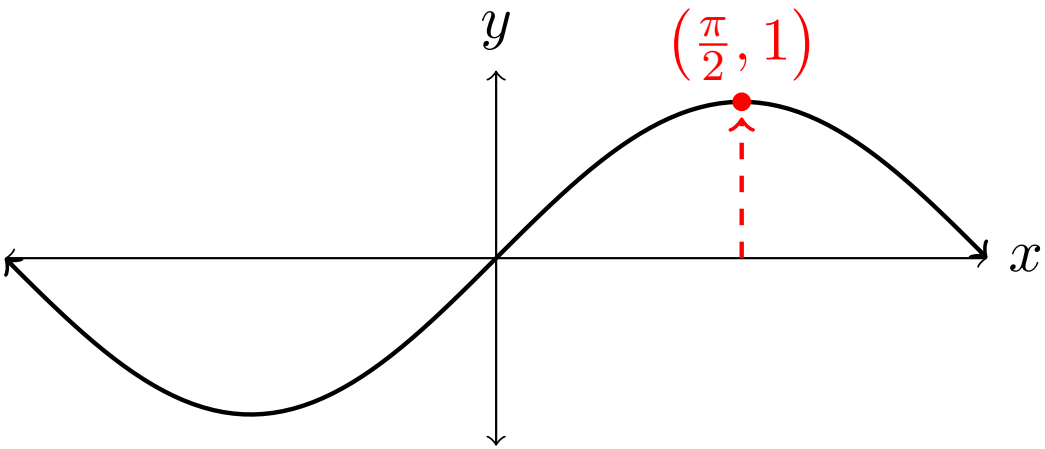
Power: Graphing

It's easy to construct graphs to your exact specifications.

```
\begin{tikzpicture}
  \draw[<->] (-pi, 0) -- (pi, 0) node[right] {$x$};
  \draw[<->] (0, -1.2) -- (0, 1.2) node[above] {$y$};
  \draw[<->, thick, domain=-pi:pi, samples=100] plot (\x, {sin(deg(\x))});
  \filldraw[fill=red,draw=red] (pi/2,1) circle (1.5pt) node[above,color=red]
      {$\left(\frac{\pi}{2}, 1\right)$};
  \draw[->,dashed,thick,color=red] (pi/2,0) -- (pi/2,0.9) ;
  \draw (0, -1.6) node {Graph of $y=\sin{(x)}$};
\end{tikzpicture}
```

Power: Graphing

Like this!



Graph of $y = \sin(x)$

The Learning Curve

With so much freedom and power in LaTeX, there is a learning curve. It can feel like it requires learning a million things to even start, or that the extra time at the beginning isn't worth it over the convenience of Word.

We promise you - the time is well invested!

How to download LaTeX

Go to this link and download for Windows or Mac (see QR code on handout)

How to learn LaTeX

For people who learn through play:

- Utilize LaTeX Stack Exchange
- Find and read manuals for various packages (can be found on CTAN (Comprehensive TeX Archive Network)

How to learn LaTeX

For people who learn through structure:

- A phenomenal beginner's guide: *The Not So Short Introduction to LaTeX*
  - ♦ in the Resources folder that will be shared
- Another beginner's guide: *LaTeX Beginner's Guide*
  - ♦ also in the Resources folder
- Read manuals! Many will be shared in the Resources folder.

Raffle

Book Giveaway!

Thank you!

Please fill out the feedback form at

`https://tinyurl.com/2023GMCsessions`

or scan the QR code below.

Feel free to e-mail either of us at

David Hornbeck: dhornbeck@rockdale.k12.ga.us

Chuck Garner: cgarner@rockdale.k12.ga.us