LaTeX + AI

The Perfect Duo for High Quality STEM Documentation

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My Works

- Samples and Templates: `https://tinyurl.com/4y6zb27c`

The Objective

Stop Fighting the Software

- Formatting nightmares of word and google docs
- Limited display options
- Inserting screenshots or pictures

Scale Your Output

- Convert a document into LaTeX
- Use AI to help with the process or reproduce new documents

Build Assets, Not Disposables

- Build once, reuse forever

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What is LaTeX?

- LaTeX (Lay-tek or Lah-tek) is not a word processor, it is a compiler
  - Word is a canvas (WYSISYG). You paint the document manually.
  - LaTeX is a compiler. You describe the structure, and it builds the pdf.
- It is the industry standard
  - Free, open source, and universal
  - The Tool: We will use Overleaf (The "Google Docs" of LaTeX)
- The difference
  - Word and Google Docs - lots of clicking and reformatting needed
  - LaTeX - lots of typing and defining, formatting based on text

Why LaTeX?

1. The AI Superpower
   - AI models are trained on code. They "speak" LaTeX fluently.
   - You can copy/paste complex math into ChatGPT/Gemini, and it understands the logic, not just the pixels.
2. Absolute Consistency
   - Copying a question from Quiz A to Quiz B never breaks the formatting.
   - Styles (Fonts, Headers) are automatic and uniform.
3. The ROI (Return on Investment)
   - The Truth: Yes, there is a learning curve.
   - The Payoff: Time invested now = Hundreds of hours saved later.

Examples - The Word/Doc Limitations

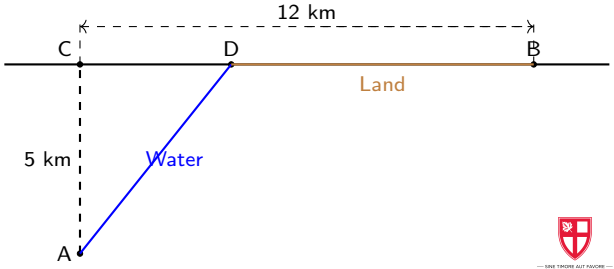
- Solve for x if $\frac{2x}{3} = 4$.
- Find $\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$
- Evaluate $\sum_{k=1}^{10} (2k + 1)$
- Divide $x + 1 \overline{)\, x^2 + 2x + 3}$
- Subtract the following

a)
$$\begin{array}{rr} & 2x^2 + \ y^2 - 3xy \\ (-) & -3x^2 + 2y^2 - 4xy \\ \hline \end{array}$$

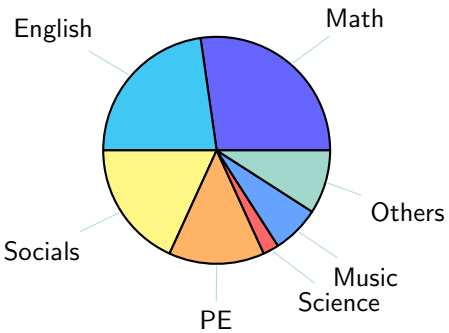
b)
$$\begin{array}{rr} & 3x^2 - 2x + 5 \\ (-) & -2x^2 + 6x - 3 \\ \hline \end{array}$$

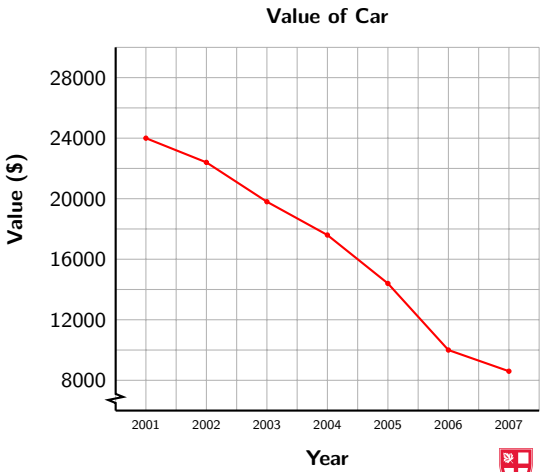
The Power of Tikz

```
\begin{tikzpicture}[scale=0.5]
    \draw[black, thick] (0,0) -- (16,0);
    \filldraw[black] (2,0) circle (2pt) node[above left] {C};
    \filldraw[black] (2,-5) circle (2pt) node[left] {A};
    \filldraw[black] (6,0) circle (2pt) node[above] {D};
    \filldraw[black] (14,0) circle (2pt) node[above] {B};
    \draw[black, thick, dashed] (2,-5) -- (2,0);
    \draw (2,-2.5) node[left] {5 km};
    \draw[<-, dashed] (2,1) -- (8,1) node[above] {12 km} -- (14,1);
    \draw[->, dashed] (8,1) -- (14,1);
    \draw[dashed] (2,0) -- (2,1.2);
    \draw[dashed] (14,0) -- (14,1.2);
    \draw[blue, thick] (2,-5) -- (6,0);
    \draw[brown, thick] (6,0) -- (14,0);
    \node[text=blue] at (4.5,-2.5) {Water};
    \node[text=brown] at (10,-0.5) {Land};
\end{tikzpicture}
```

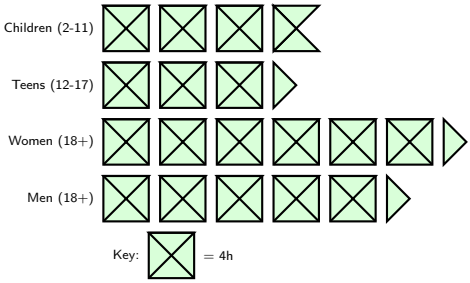


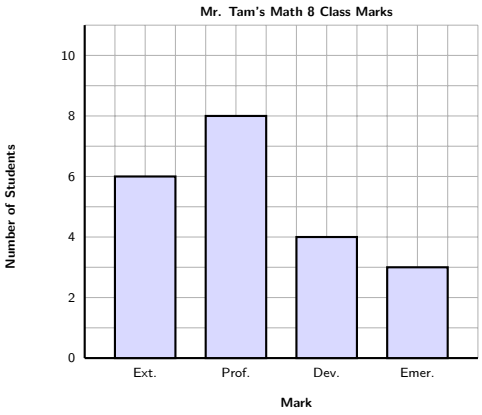
Other Examples - Charts 1





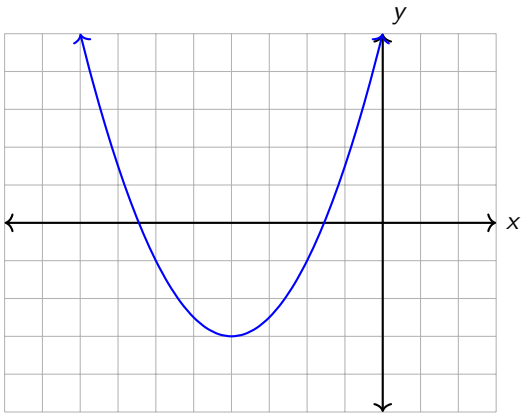
Other Examples - Charts 2





Custom Commands - Easier User Adoption

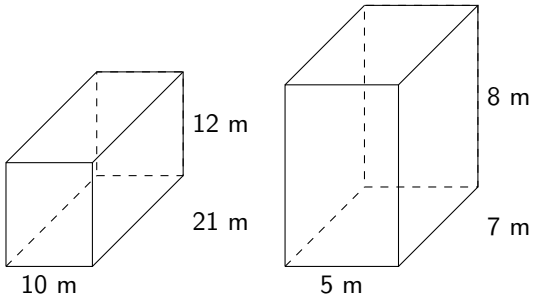
```
\begin{tikzpicture}[scale=0.5]
    \drawgaxis{-10}{3}{-5}{5}
    \drawquad{0.5}{-4}{-3}{-8}{0}
\end{tikzpicture}
```



Custom Commands - Easier User Adoption

```
\drawrectprism{10}{21}{12}{m}{0.6}

\drawrectprism{5}{7}{8}{m}{0.6}
```



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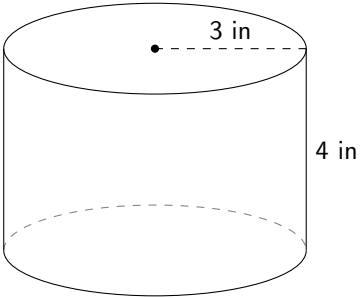
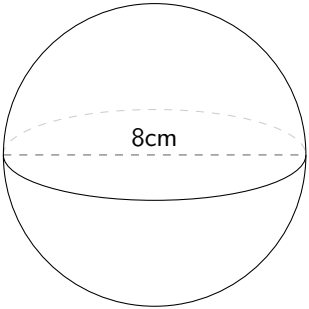
Custom Commands - Easier User Adoption

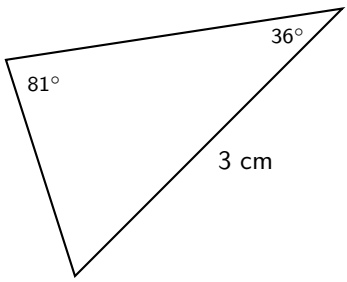
```
\drawcylinder{3}{4}{in}
\drawsphere{4}{cm}
```





Custom Commands - Easier User Adoption

```
\begin{tikzpicture}
    \drawanytriangle[45]{10}{6}{9}
    \labelside[below right]{A}{B}{3 cm};
    \drawangle[0.6]{A}{C}{B};
    \drawangle{C}{B}{A};
\end{tikzpicture}
```



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LaTeX Usage - Emerging (L1-L2) - The Prompter

- Ask AI to build an entire LaTeX document
- Use clear prompts
- Ask AI to refine, edit, or change
- Can try to upload PDF $\rightarrow$ Convert to LaTeX

LaTeX Usage - Developing (L3-L4) - The Editor

- Can look at a LaTeX document and identify where equations start and end
- Can edit and change values to display what they want
- Familiar with LaTeX code for math symbols
- Understand that there are **packages** that do certain tasks
- Can "spot fix" code if an error occurs

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LaTeX Usage - Proficient (L5-L6) - The Builder

- Can format the document mostly as desired
- Can comfortably use environments in the code
- Use of AI is more individualized
- Can share the template with AI to retain formatting
- Exploring tikz and graphics

LaTeX Usage - Extending (L7-L8) - The Architect

- Can utilize tikz confidently
- Introducing custom commands for repeated processes
- Building banks of questions
- Creating your own custom package and style guide

The Overleaf Workflow

- No install needed
- Any OS works, just needs a web browser
- Department collaboration and version control
- Demonstrate SGS workflow
  - Test Bank - Proof of Concept

Build Your Own LaTeX Document

1. Create an Overleaf account
2. Upload a template to work out of
3. Try to build your questions the way you want to
4. Ask AI to help you if you're stuck
5. Feel free to share with **dtam@stgeorges.bc.ca**

Prompt Starts

- Create a LaTeX math quiz using the **exam class**. Including 3 trigonometric identities questions inside the **questions environment**, and **wrap the answers in solution blocks**. Have a **printanswers toggle**.
- `https://www.overleaf.com/read/kmbtjbcvhqkf#dc2bae`

Prompt Starter - With Template

- Make a new version of this unit test. Keep questions mostly the same and just change a few numbers here and there. Provide solutions as well please using solution blocks and have the printanswers toggle.
- Paste in LaTeX code from template
- `https://www.overleaf.com/read/kmbtjbcvhqkf#dc2bae`