LaTex Workshop

Melissa Beerbower

Professional Development

Agenda

Create 4 documents in Overleaf file:

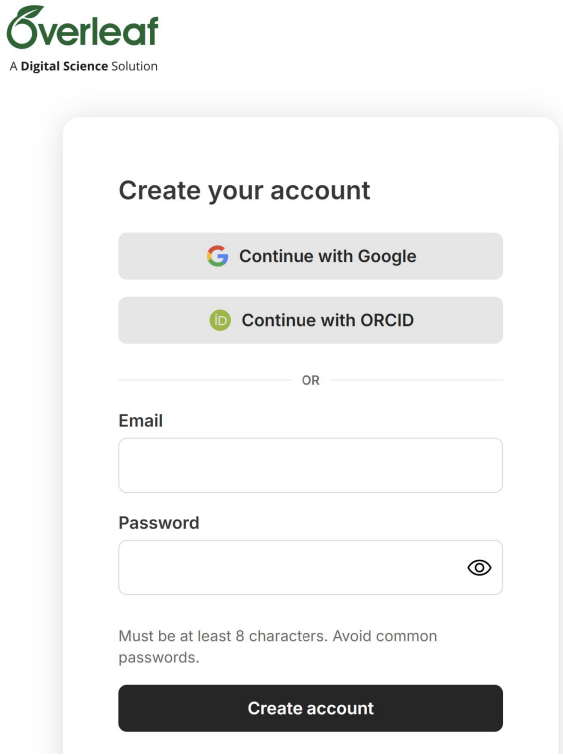
- Article Draft
- Research Log
- Bibliography
- Annotated Bibliography

Populate those files with material:

- Article Draft: nothing yet!
- Research Log: examples of common math content
- Bibliography: current reading materials
- Annotated Bibliography: nothing yet!

Make an Account on Overleaf

https://www.overleaf.com/register



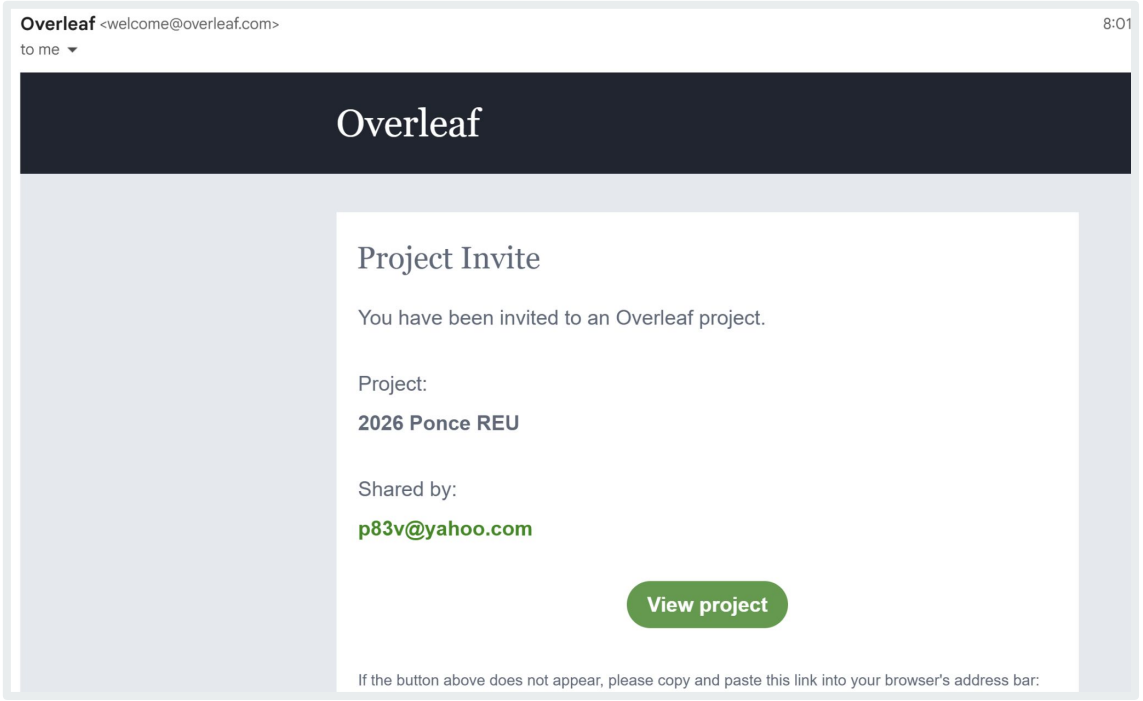
Accept Invite to Research Experience for Undergrads

The free version of Overleaf doesn't allow access to multiple editors. For undergraduate research, your graduate mentors and professors need access.

Send the email you used for your Overleaf accounts to the professor mentoring your undergraduate research, and they will send you an invite to join the REU Overleaf.

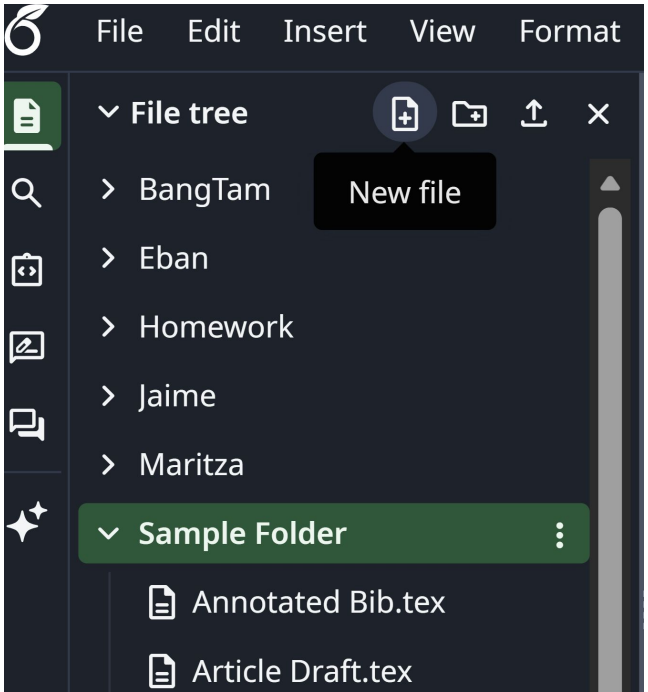
Check your emails and join the project!

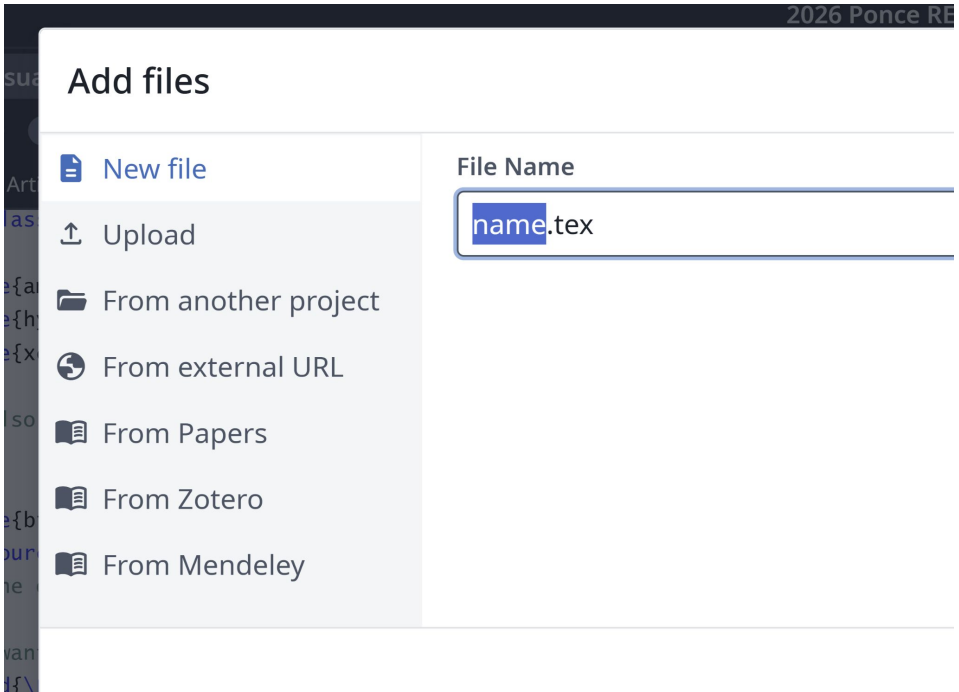
If your mentors don't already have a Sample Folder in the REU file, you can find the Sample Folder on my website.



Create ‘Article Draft’ in Your Folder

- You may rename your folder with your preferred name.
- Create a new file in your folder. Name it ‘Article Draft’.
- Copy code from document titled ‘Article Draft’ in the Sample Folder (see next slide).





File Edit Insert View Format Help

2026 Ponce REU

Share Upgrad

File tree

- BangTam
- Eban
- Jaime
- Maritza
- Sample Folder
  - Annotated Bib.tex
  - Article Draft.tex
  - Bibliography.bib
  - Poster.tex
  - Research Log.tex
  - Slide Deck.tex
- Tung

File outline

- Introduction.
- Main Results.
- Future Work.

Code Editor | Visual Editor | Normal text | WRITEFULL

Sample Folder > Article Draft.tex

```
\documentclass{amsart}

\usepackage{amsmath}
\usepackage{hyperref} %You need this for the email format
\usepackage{xcolor} %You need this for colored text

%You can also include multiple packages in one line: \usepackage{amsmath, hyperref}

\usepackage{biblatex} %Imports biblatex package
\addbibresource{Bibliography.bib} %Import the bibliography file
%This is one of several ways to make a bibliography in LaTeX.

%You will want to use commands to make typing easier
\newcommand{\PF}{\mathrm{PF}}

%The commands below allow your mentors to make comments within the body of your work.
\newcommand{\pamela}[1]{{\bf\color{purple}Pamela: #1}}
\newcommand{\cyrus}[1]{{\bf\color{blue}Cyrus: #1}}
\newcommand{\jennifer}[1]{{\bf\color{green}Jennifer: #1}}
\newcommand{\melissa}[1]{{\bf\color{cyan}Melissa: #1}}

\title{Title}


%\date{\today}


\author[You]{Your Name}
\address[Y.~Name]{Your University}
 \email{\href{you@youruniversity.edu}{you@youruniversity.edu}}


\author[Beerbower]{Melissa Beerbower}


\author[Elder]{Jennifer Elder}
\address[J.~Elder]{Department of Computer Science, Mathematics and Physics,
```

Recompile | 1 / 1 | 101%

TITLE

YOUR NAME, MELISSA BEERBOWER, JENNIFER ELDER, PAMELA E. HARRIS, AND CYRUS YOUNG

Abstract. We will write an abstract together.

1. Introduction.

We denote the set of parking functions of length n by PF_n. Melissa: Good luck with LaTeX!

There may or may not be a connection between parking functions and [1]. However, this style of bibliography prints only items from the bib file that we cite in the body of the article.

2. Main Results.

3. Future Work.

References

[1] Bruce E. Sagan and Foster Tom. "Chromatic symmetric functions and change of basis". In: *Algebr. Comb.* 9.1 (2026), pp. 307–325. ISSN: 2589-5486. DOI: 10.5802/alco.468. URL: https://doi.org/10.5802/alco.468.

(Y. Name) Your University
Email address: you@youruniversity.edu

(J. Elder) Department of Computer Science, Mathematics and Physics, Missouri Western State University, St. Joseph, MO 64507
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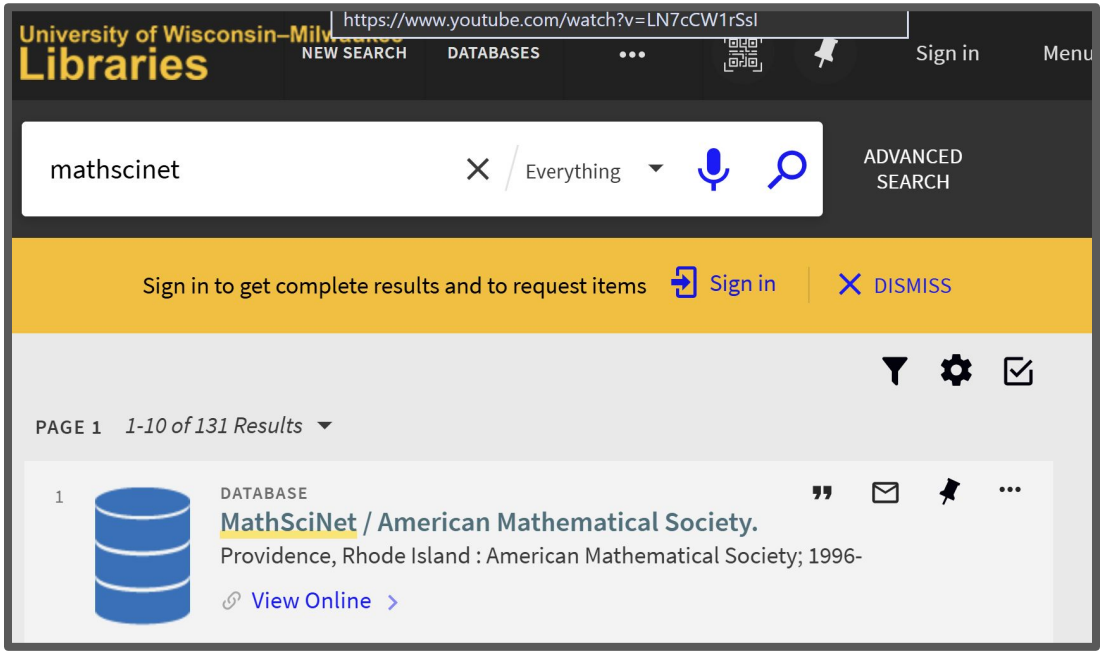
Email address: young424@uwm.edu

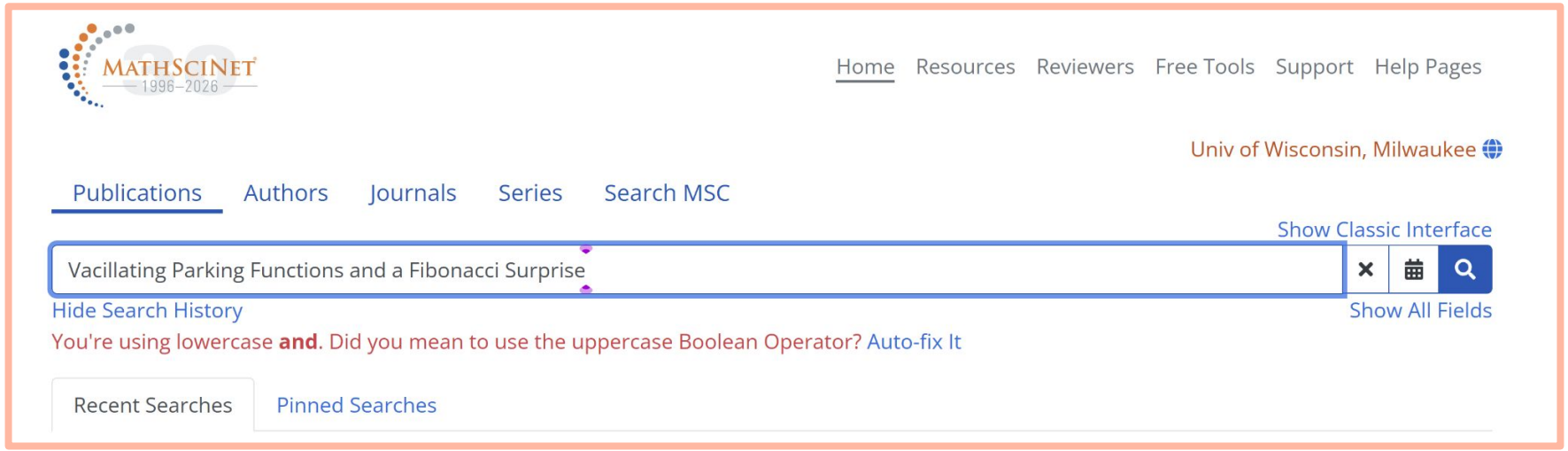
Create Bibliography

- Create new document in file. Name it xyz.bib.
- In another tab, go your university's library and search for MathSciNet. You will be prompted to log in with your university ID.



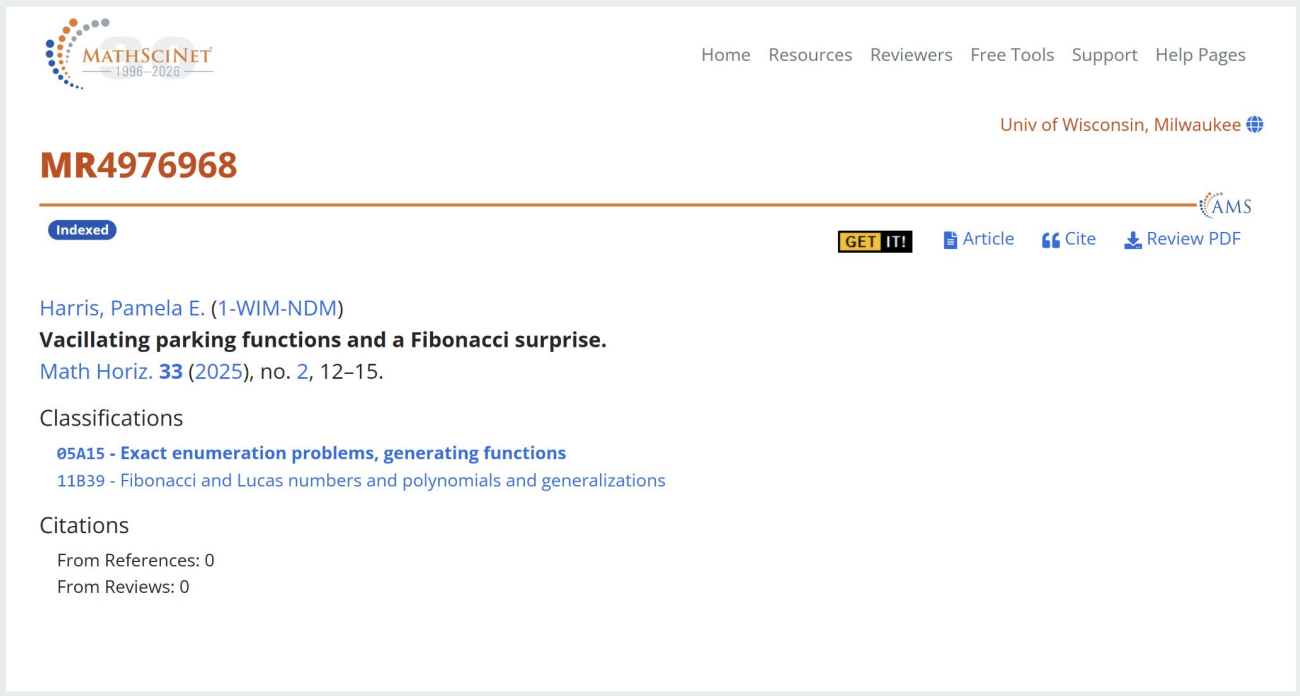
Create Bibliography

- Open the Homework folder. The articles you have been assigned should be here.
- In another tab, go to [Publications Search - MathSciNet](). Search for the articles.

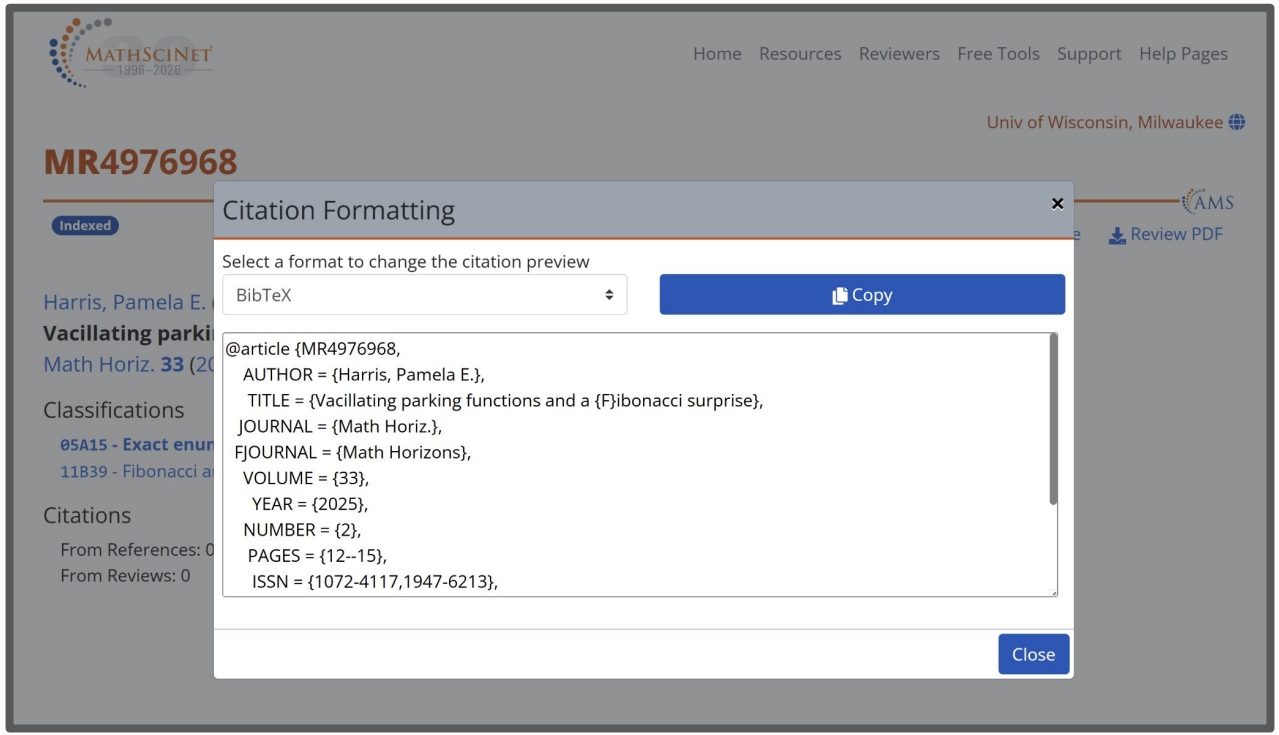


MathSciNet

Find citations for the articles in Homework folder from MathSciNet. (Note that you cannot do this for the papers by Kimberly Hadaway.)

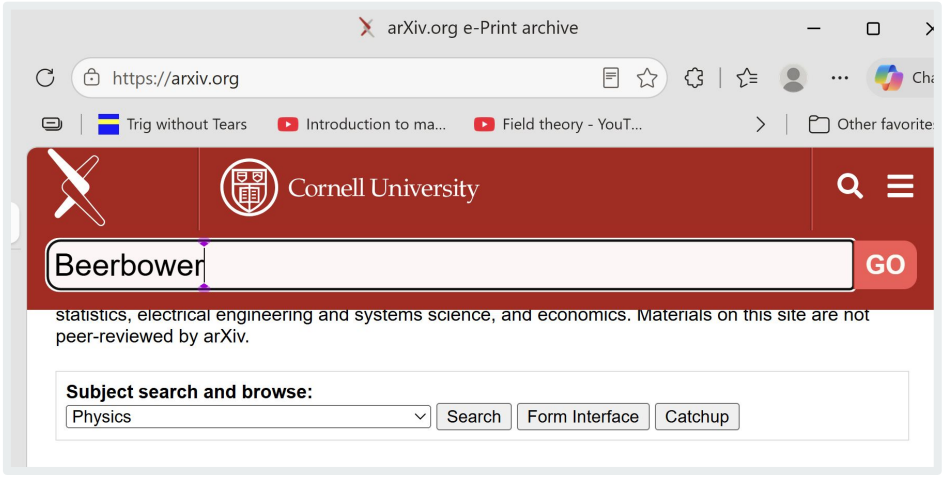


Copy Citations and Paste into Your Bibliography



ArXiV: Unpublished Articles

Math research is ongoing! Frequently, you need to cite articles that have not yet been officially published. Researchers often post their work on ArXiV when they submit it to a journal. Even after an article is accepted for publication, only the ArXiV version will be available until the print version is publishable, at which point then the article will be posted to MathSciNet.

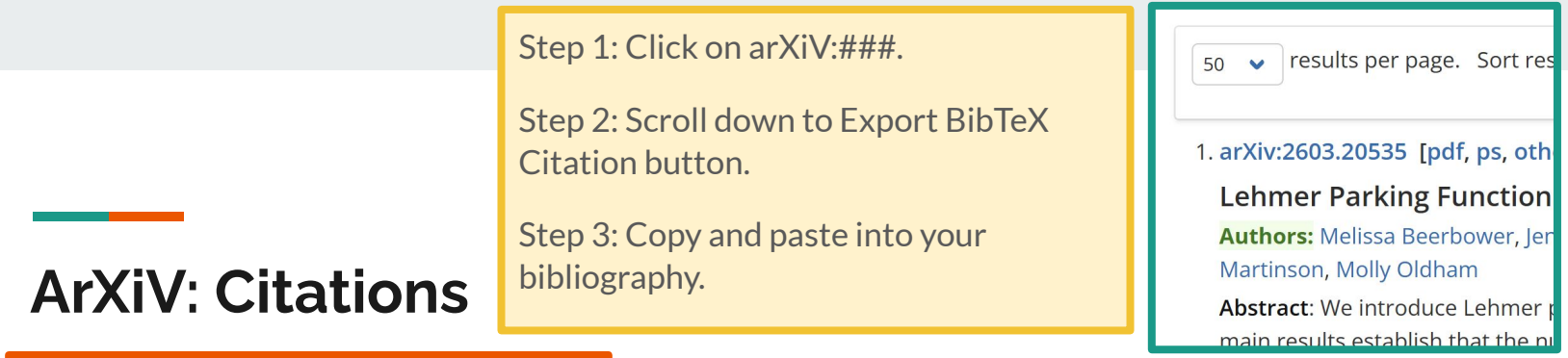


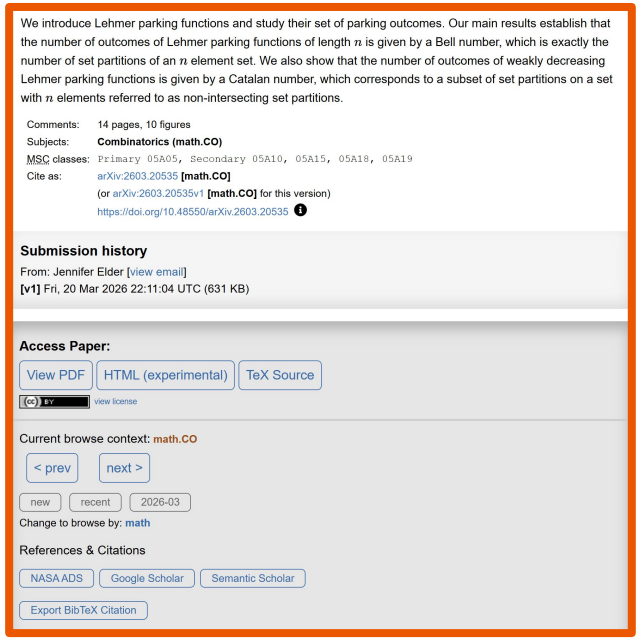
ArXiV: Citations

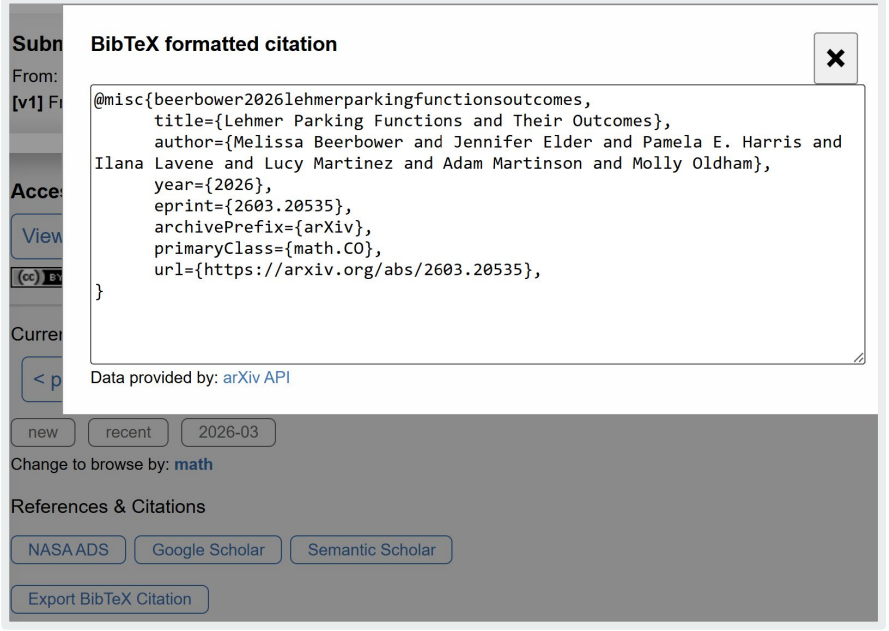
Step 1: Click on arXiV:###.

Step 2: Scroll down to Export BibTeX Citation button.

Step 3: Copy and paste into your bibliography.



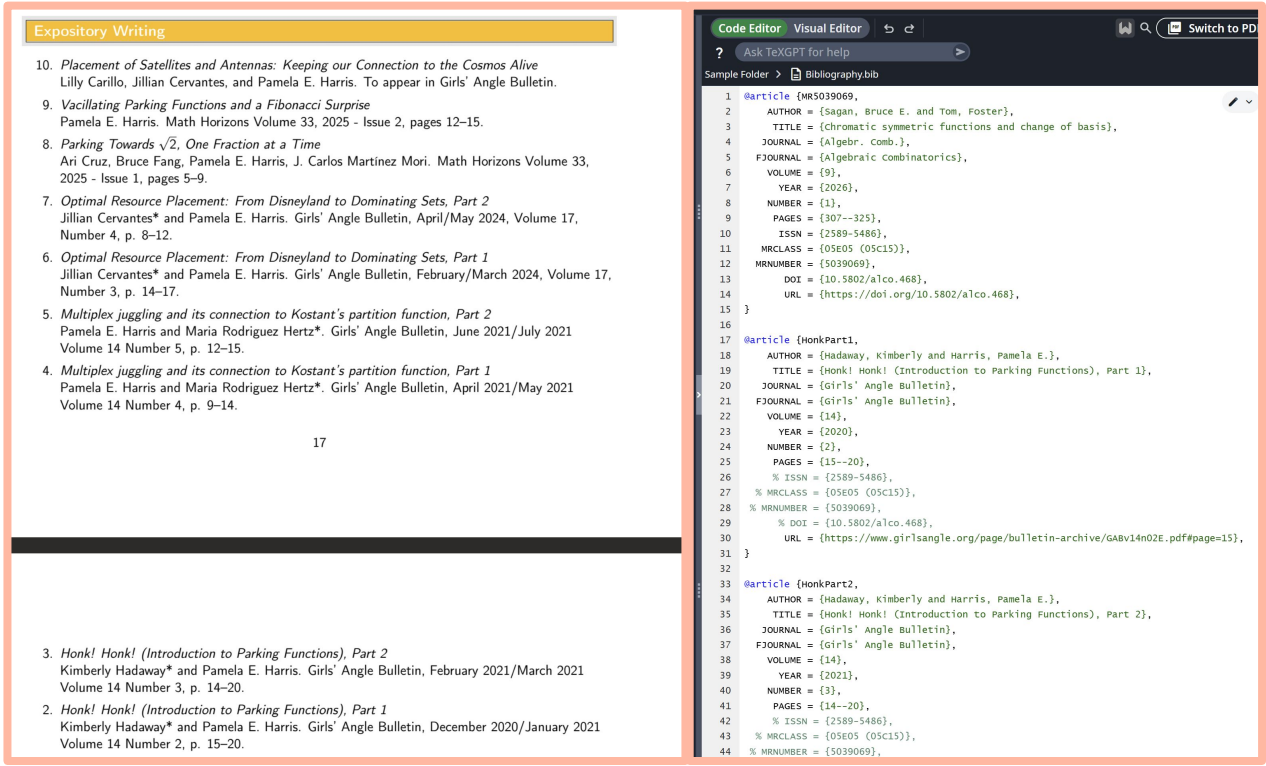




Citing Expository or Humanities Paper

In the Homework Folder, you will find one of Kimberly Hadaway's expository papers, co-athored with Dr. Pamela E. Harris. This paper is not on ArXiV or MathSciNet. The citation is on Dr. Harris's CV. Go to their professional website and search their CV.

In your bib, copy and paste a typical entry and fill in the info for the expository paper.



Expository Writing

10. *Placement of Satellites and Antennas: Keeping our Connection to the Cosmos Alive*
Lilly Carillo, Jillian Cervantes, and Pamela E. Harris. To appear in Girls' Angle Bulletin.
9. *Vacillating Parking Functions and a Fibonacci Surprise*
Pamela E. Harris. Math Horizons Volume 33, 2025 - Issue 2, pages 12–15.
8. *Parking Towards $\sqrt{2}$, One Fraction at a Time*
Ari Cruz, Bruce Fang, Pamela E. Harris, J. Carlos Martínez Mori. Math Horizons Volume 33, 2025 - Issue 1, pages 5–9.
7. *Optimal Resource Placement: From Disneyland to Dominating Sets, Part 2*
Jillian Cervantes* and Pamela E. Harris. Girls' Angle Bulletin, April/May 2024, Volume 17, Number 4, p. 8–12.
6. *Optimal Resource Placement: From Disneyland to Dominating Sets, Part 1*
Jillian Cervantes* and Pamela E. Harris. Girls' Angle Bulletin, February/March 2024, Volume 17, Number 3, p. 14–17.
5. *Multiplex juggling and its connection to Kostant's partition function, Part 2*
Pamela E. Harris and Maria Rodriguez Hertz*. Girls' Angle Bulletin, June 2021/July 2021 Volume 14 Number 5, p. 12–15.
4. *Multiplex juggling and its connection to Kostant's partition function, Part 1*
Pamela E. Harris and Maria Rodriguez Hertz*. Girls' Angle Bulletin, April 2021/May 2021 Volume 14 Number 4, p. 9–14.

17

3. *Honk! Honk! (Introduction to Parking Functions), Part 2*
Kimberly Hadaway* and Pamela E. Harris. Girls' Angle Bulletin, February 2021/March 2021 Volume 14 Number 3, p. 14–20.
2. *Honk! Honk! (Introduction to Parking Functions), Part 1*
Kimberly Hadaway* and Pamela E. Harris. Girls' Angle Bulletin, December 2020/January 2021 Volume 14 Number 2, p. 15–20.

Code Editor | Visual Editor | Switch to PD

Ask TeXGPT for help

Sample Folder > Bibliography.bib

```
@article {MR5039069,
    AUTHOR = {Sagan, Bruce E. and Tom, Foster},
     TITLE = {chromatic symmetric functions and change of basis},
   JOURNAL = {Algebr. Comb.},
  FJOURNAL = {Algebraic Combinatorics},
    VOLUME = {9},
      YEAR = {2026},
    NUMBER = {1},
     PAGES = {307--325},
      ISSN = {2589-5486},
   MRCLASS = {05E05 (05C15)},
  MRNUMBER = {5039069},
       DOI = {10.5802/alco.468},
       URL = {https://doi.org/10.5802/alco.468},
}

@article {HonkPart1,
    AUTHOR = {Hadaway, Kimberly and Harris, Pamela E.},
     TITLE = {Honk! Honk! (Introduction to Parking Functions), Part 1},
   JOURNAL = {Girls' Angle Bulletin},
  FJOURNAL = {Girls' Angle Bulletin},
    VOLUME = {14},
      YEAR = {2020},
    NUMBER = {2},
     PAGES = {15--20},
     % ISSN = {2589-5486},
  % MRCLASS = {05E05 (05C15)},
 % MRNUMBER = {5039069},
      % DOI = {10.5802/alco.468},
       URL = {https://www.girlsangle.org/page/bulletin-archive/GABv14n02E.pdf#page=15},
}

@article {HonkPart2,
    AUTHOR = {Hadaway, Kimberly and Harris, Pamela E.},
     TITLE = {Honk! Honk! (Introduction to Parking Functions), Part 2},
   JOURNAL = {Girls' Angle Bulletin},
  FJOURNAL = {Girls' Angle Bulletin},
    VOLUME = {14},
      YEAR = {2021},
    NUMBER = {3},
     PAGES = {14--20},
     % ISSN = {2589-5486},
  % MRCLASS = {05E05 (05C15)},
 % MRNUMBER = {5039069},
```

Create ‘Research Log’ & ‘Annotated Bibliography’

- Create two more files, one named ‘Research Log’ and one named ‘Annotated Bibliography’.
- Copy code from the files of the same name in the Sample Folder.
- These files are for your notes. You may format them any way you wish. The code is just to get you started.
- Starting today, you will write in your ‘Research Log’ everyday!
- In the Bibliography Workshop, we will discuss how to do a proper and thorough bibliography search. That’s when you will start filling your Annotated Bibliography.

Adding Material to Your Files

Now you have four files in your folder:

- Article Draft
- Daily Log
- Bibliography
- Annotated Bibliography

Next, we are going to practice formatting typical content such as matrices, tables, images, lists, and equations in your Research Log file.

Note About Preambles & Packages

As you use in Overleaf, it is helpful to add only packages that you need to your file. Less clutter helps you to better observe cause and effect when you are experimenting with all the fun techniques you find online.

For the exercises in this workshop, assume that you do not need to add a package unless the exercise explicitly says to add a package. Note that you are starting with just one package, amsmath.

Always add packages before \begin{document}. Everything before \begin{document} is called the Preamble. Preambles are for packages, commands, formatting titles, and author information.

Equations 101

Here are four ways to include an equation in LaTeX:

- Inline with $$,
- Within backslashes and brackets \[\],
- In an equation environment, and
- In an align environment.

Equations I

```
6
7  \begin{document}
8  \maketitle
9
10 You can write an equation or math symbol within the body of a paragraph by
   enclosing it in dollars signs: $f(x)=x^2.$ Then you can continue writing.
11
12 You can write an equation within backslashes and brackets within a paragraph.
   This environment will break your paragraph and center your equation, like this.
    \[f(x)=x^2\] And then you can proceed with what you were writing. You can also
   use backslashes and brackets on their own outside a paragraph, like this:
13
14 \[f(x)=x^2\]
15
16 Or even like this:
17
18 \[
19 f(x) =
20 \begin{cases}
21 x^2, & \text{if } x \geq 0 \\
22 -x,  & \text{if } x < 0
23 \end{cases}
24 \]
```

Code to the left; complied to the right.

Notice that you don't need to add any packages to your file to implement these techniques.

Note that \[\] automatically centers equations.

Note {cases} environment. Fancy!

You can write an equation or math symbol within the body of a paragraph by enclosing it in dollars signs: $f(x) = x^2$. Then you can continue writing.

You can write an equation within backslashes and brackets within a paragraph. This environment will break your paragraph and center your equation, like this.

$$f(x) = x^2$$

And then you can proceed with what you were writing. You can also use backslashes and brackets on their own outside a paragraph, like this:

$$f(x) = x^2$$

Or even like this:

$$f(x) = \begin{cases} x^2, & \text{if } x \geq 0 \\ -x, & \text{if } x < 0 \end{cases}$$

Equations II

Code to the left; compiled to the right.

Notice the **.

Notice use of \frac, \binom, \cdots.

```
25
26  For particularly long or grand equations, you may want to use the equation
    environment:
27
28  \begin{equation*}
29      f(x) = x^2.
30  \end{equation*}
31
32  Notice the asterisk. If you remove the asterisk, LaTeX will number all the
    equations in the equation environment in your paper.
33
34  \begin{equation}
35      f(x) = x^2.
36  \end{equation}
37
38  \begin{equation}
39      \binom{n}{m}=\frac{n!}{(n-m)!m!}.
40  \end{equation}
41
42  \begin{equation}
43      n!= n(n-1)(n-2) \cdots 2(1).
44  \end{equation}
45
46
```

For particularly long or grand equations, you may want to use the equation environment:

$$f(x) = x^2.$$

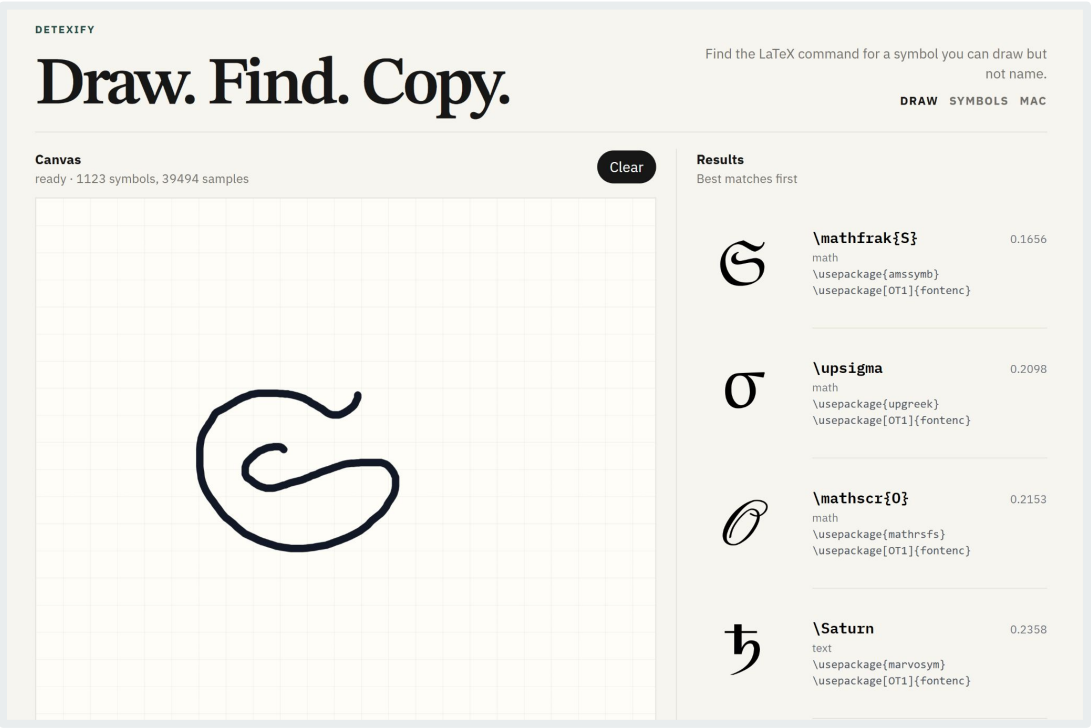
Notice the asterisk. If you remove the asterisk, LaTeX will number all the equations in the equation environment in your paper.

(1) $$f(x) = x^2.$$

(2) $$\binom{n}{m} = \frac{n!}{(n-m)!m!}.$$

(3) $$n! = n(n-1)(n-2)\cdots 2(1).$$

Detexify & Packages



Detexify LaTeX handwritten symbol recognition

When you don't know how to type a math symbol in LaTeX, go to Detexify and draw it. To the right, you will see the code that you need. When it says 'math mode' that means you must type it between $$ or in an equation or align environment.

Equations Exercise

Assignment: Type these equations into your Research Log.

$$\mathbb{Z}_{2^3} \times \mathbb{Z}_{2^2} \times \mathbb{Z}_3 \times \mathbb{Z}_{3^4} \times \mathbb{Z}_5 \times \mathbb{Z}_5 \times \mathbb{Z}_{17} \times \mathbb{Z}_{17^8} \times \mathbb{Z}_{983}$$

```
15
16  $\{a,b\}$
17
18  {a,b}
19
20  $x_a, X_{abc}$
```

$$G \cong F(\{a, b\})/\ker \pi \longrightarrow H.$$

$$\int_a^b f'(t)\,dt = f(b) - f(a)$$

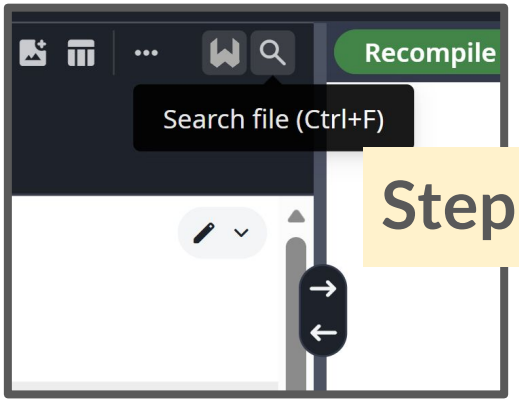
$\{a, b\}$
a,b
x_a, X_{abc}

Commands, Find and Replace

Assignment: Create a command for the integer symbol. Implement the command and replace every \mathbb{Z} from the last exercise with a \Z.

```
8  \newcommand{\Z}{\mathbb{Z}}
9
10
11 \title{Your Research Log}
12
13 \begin{document}
14 \maketitle
15
16
17 $\mathbb{Z}_{2^3} \times\mathbb{Z}_{2^2} \times\mathbb{Z}_{3}
   \times\mathbb{Z}_{3^4} \times\mathbb{Z}_{5} \times\mathbb{Z}_{5}
   \times\mathbb{Z}_{17} \times\mathbb{Z}_{17^8} \times\mathbb{Z}_{983}$
18
19
```

Step 1



Step 2

$$\mathbb{Z}_{2^3} \times \mathbb{Z}_{2^2} \times \mathbb{Z}_{3} \times \mathbb{Z}_{3^4} \times \mathbb{Z}_{5} \times \mathbb{Z}_{5} \times \mathbb{Z}_{17} \times \mathbb{Z}_{17^8} \times \mathbb{Z}_{983}$$

Step 3

Equations in Align Environment

In the align environment, everything in in math mode, so you have to type \text{} for words.

& indicates where you want your equations to line up. You can make multiple &'s per line, but you must use the same number on each line.

Cayley's Theorem states that every group is a subgroup of the symmetric group. Hence,

$$\begin{aligned}
\mathbb{Z}_2 \times \mathbb{Z}_2 \times \mathbb{Z}_2 &= G && \text{ is a group, }\\
\iff \mathbb{Z}_2 \times \mathbb{Z}_2 \times \mathbb{Z}_2 &\leq \mathfrak{S}_n && \text{ for some positive integer } n.\\
|\mathbb{Z}_2 \times \mathbb{Z}_2 \times \mathbb{Z}_2| &= 8 && \text{ give us that, }\\
n &\geq 4 && \text{ since,}\\
\mathfrak{S}_3 &< 8 < \mathfrak{S}_4 && \text{ in fact, we claim that,}\\
G &< \mathfrak{S}_6. &&
\end{aligned}$$

$G \cong \{(12), (34), (56), (12)(34), (12)(56), (34)(56), (12)(34)(56), e\}$.

```
9
10  Cayley's Theorem states that every group is a subgroup of the symmetric group. Hence,
11
12  \begin{align*}
13  \mathbb{Z}_2 \times \mathbb{Z}_2 \times \mathbb{Z}_2 &= G & \text{ is a group, }\\
14  \iff \mathbb{Z}_2 \times \mathbb{Z}_2 \times \mathbb{Z}_2 & \leq \mathfrak{S}_n &
    \text{ for some positive integer $n$}.\\
15  |\mathbb{Z}_2 \times \mathbb{Z}_2 \times \mathbb{Z}_2| &= 8 & \text{ give us that, }\\
16  n &\geq 4 & \text{ since,}\\
17  \mathfrak{S}_3 &< 8 < \mathfrak{S}_4 &\text{ in fact, we claim that,}\\
18  G &< \mathfrak{S}_6. &
19  \end{align*}
20
21
22  $G \cong \{(12), (34), (56), (12)(34), (12)(56), (34)(56), (12)(34)(56), e\}$.
```

Notice that \\ indicates the end of a line but that you must not put \\ on the last line.

Notice the asterisk *. Just like in the equation environment, the asterisk tells LaTeX to not number the lines.

However, the * in align environment numbers on the right of the page, rather than the left.

Equations in Align Assignment

Assignment: Type this equation sequence from *Linear Algebra Done Wrong* into your Research Log.

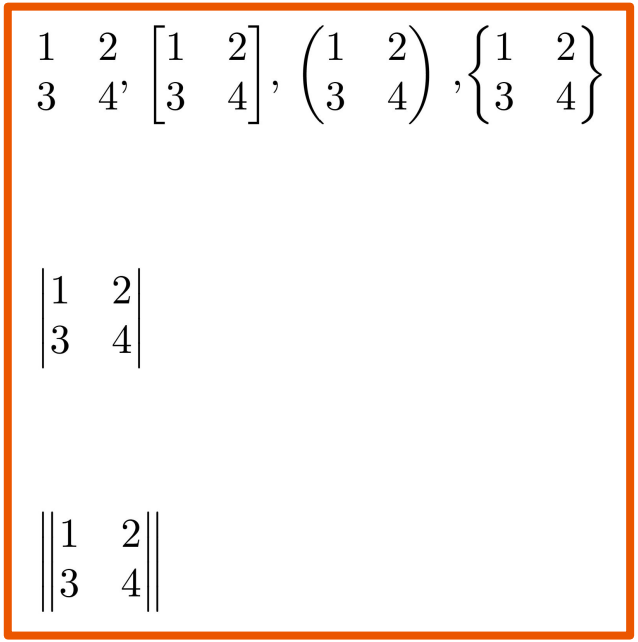
As an illustration, let us write down a formal proof of the first distributive law (axiom 7) of a vector space. We want to show that $\alpha(T_1 + T_2) = \alpha T_1 + \alpha T_2$. For any $\mathbf{v} \in V$

$$\begin{aligned}
\alpha(T_1 + T_2)\mathbf{v} &= \alpha((T_1 + T_2)\mathbf{v}) && \text{by the definition of multiplication} \\
&= \alpha(T_1\mathbf{v} + T_2\mathbf{v}) && \text{by the definition of the sum} \\
&= \alpha T_1\mathbf{v} + \alpha T_2\mathbf{v} && \text{by Axiom 7 for } W \\
&= (\alpha T_1 + \alpha T_2)\mathbf{v} && \text{by the definition of the sum}
\end{aligned}$$

So indeed $\alpha(T_1 + T_2) = \alpha T_1 + \alpha T_2$.

Matrices

Note that you don't need to add any packages to make matrices.




```
17
18  $\begin{matrix}
19      1 & 2\\
20      3 & 4
21  \end{matrix}$,
22  $\begin{bmatrix}
23      1 & 2\\
24      3 & 4
25  \end{bmatrix}$,
26  $\begin{pmatrix}
27      1 & 2\\
28      3 & 4
29  \end{pmatrix}$
30  ,$\begin{Bmatrix}
31      1 & 2\\
32      3 & 4
33  \end{Bmatrix}$
34
35  $\begin{vmatrix}
36      1 & 2\\
37      3 & 4
38  \end{vmatrix}$
39
40  $\begin{Vmatrix}
41      1 & 2\\
42      3 & 4
43  \end{Vmatrix}$
44
```

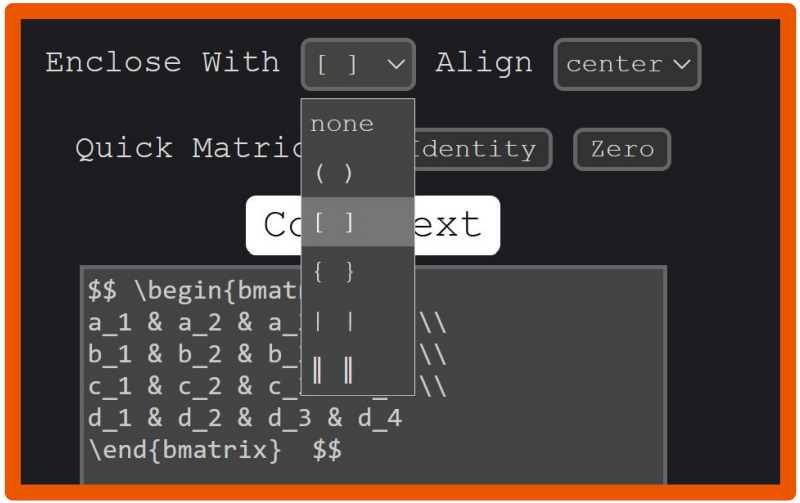
Put $$ around your matrix, not around every entry!

Commas, but no empty lines creates inline list.

Letters b, B, v, V, p, create different closures for matrices

Matrix Generator

Making matrices can be annoying. Here is a little short cut: [LaTeX Matrix Generator](#).



Matrices

Assignment: Create this matrix from *Linear Algebra Done Wrong*.

You will need to use the following code:

\hdots \vdots

a_{m,n} a_n

Curious? Try \ddots, \ldots, \cdots, \cdot, \therefore, \because

1. Different faces of linear systems.

There exist several points of view on what a system of linear equations, or in short a *linear system* is. The first, naïve one is, that it is simply a collection of m linear equations with n unknowns $x_1, x_2, \dots, x_n$,

$$\begin{cases} a_{1,1}x_1 + a_{1,2}x_2 + \dots + a_{1,n}x_n = b_1 \\ a_{2,1}x_1 + a_{2,2}x_2 + \dots + a_{2,n}x_n = b_2 \\ \dots \\ a_{m,1}x_1 + a_{m,2}x_2 + \dots + a_{m,n}x_n = b_m \end{cases}.$$

To solve the system is to find *all* n-tuples of numbers $x_1, x_2, \dots, x_n$ which satisfy all m equations simultaneously.

If we denote $\mathbf{x} := (x_1, x_2, \dots, x_n)^T \in \mathbb{F}^n$, $\mathbf{b} = (b_1, b_2, \dots, b_m)^T \in \mathbb{F}^m$, and

$$A = \begin{pmatrix} a_{1,1} & a_{1,2} & \dots & a_{1,n} \\ a_{2,1} & a_{2,2} & \dots & a_{2,n} \\ \vdots & \vdots & & \vdots \\ a_{m,1} & a_{m,2} & \dots & a_{m,n} \end{pmatrix},$$

then the above linear system can be written in the *matrix form* (as a *matrix-vector equation*)

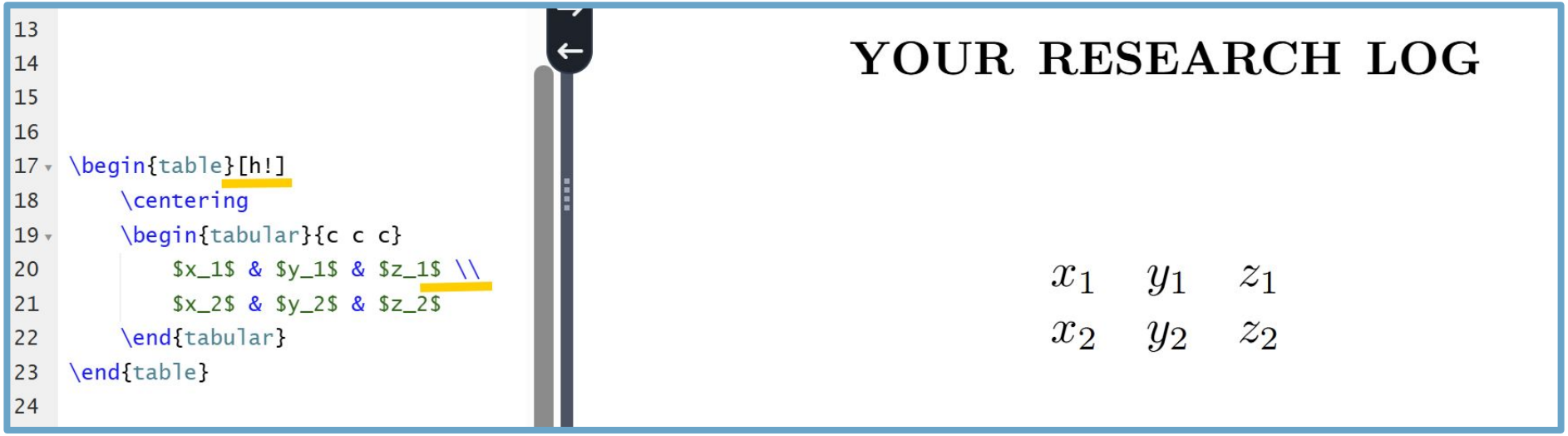
$$A\mathbf{x} = \mathbf{b}.$$

To solve the above equation is to find all vectors $\mathbf{x} \in \mathbb{F}^n$ satisfying $A\mathbf{x} = \mathbf{b}$.

Tables

LaTeX has several options for tables (Tables - Overleaf, Online LaTeX Editor). Here is one way. Notice that [h!] keeps your table *approximately* where you typed it. Notice that \\ ends a line, but you don't use it on the last line of the table.

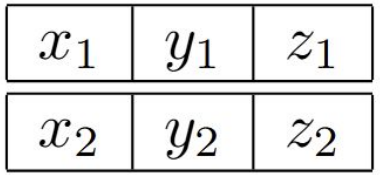
```
13
14
15
16
17 \begin{table}[h!]
18     \centering
19     \begin{tabular}{c c c}
20         $x_1$ & $y_1$ & $z_1$ \\
21         $x_2$ & $y_2$ & $z_2$
22     \end{tabular}
23 \end{table}
24
```



Tables

Let's add some lines to make our table easier to read.

```
\begin{table}[h!]
    \centering
    \begin{tabular}{|c | c | c |}
    \hline
        $x_1$ & $y_1$ & $z_1$ \\
        \hline
        \hline
        $x_2$ & $y_2$ & $z_2$\\
        \hline
    \end{tabular}
\end{table}
```



Tables

Assignment: Here is a table from Dummit & Foote's 'Abstract Algebra,' p. 160. Add this table to your Research Log. You will need the following code: \cdot, \times, and \textbf{bold text here}.

Similarly, all permissible lists of invariant factors and the corresponding abelian groups of order 180 are easily seen to be the following:

Invariant Factors	Abelian Groups
$2^2 \cdot 3^2 \cdot 5$	Z_{180}
$2 \cdot 3^2 \cdot 5,\ 2$	$Z_{90} \times Z_2$
$2^2 \cdot 3 \cdot 5,\ 3$	$Z_{60} \times Z_3$
$2 \cdot 3 \cdot 5,\ 2 \cdot 3$	$Z_{30} \times Z_6$

Lists with Itemize

What if you want to make a bulleted list? Use itemize:

- Apple
- Frog
- Yo-yo
- Shoes

What if you are itemizing a list of equations? Use math mode:

- $x^2 + 2x + 7 = 0$
- $\frac{x^2-1}{x+1}$

What if you want an alphabetized list? Add letters like this:

(a) $7 \times 6 = 42$
(b) $42 \div 7 = 6$

```
11
12  \begin{itemize}
13      \item Apple
14      \item Frog
15      \item Yo-yo
16      \item Shoes
17  \end{itemize}
18
19
20  \begin{itemize}
21      \item $x^2 +2x +7=0$
22      \item $\frac{x^2-1}{x+1}$
23  \end{itemize}
24
25
26  \begin{itemize}
27      \item [(a)] $7 \times 6=42$
28      \item [(b)] $42 \div 7 =6$
29  \end{itemize}
30
```

Lists with Enumerate

Notice that I did not need to add a package to the file to use enumerate or any of the symbols in these equations.

What if you want a numbered list? Use enumerate:

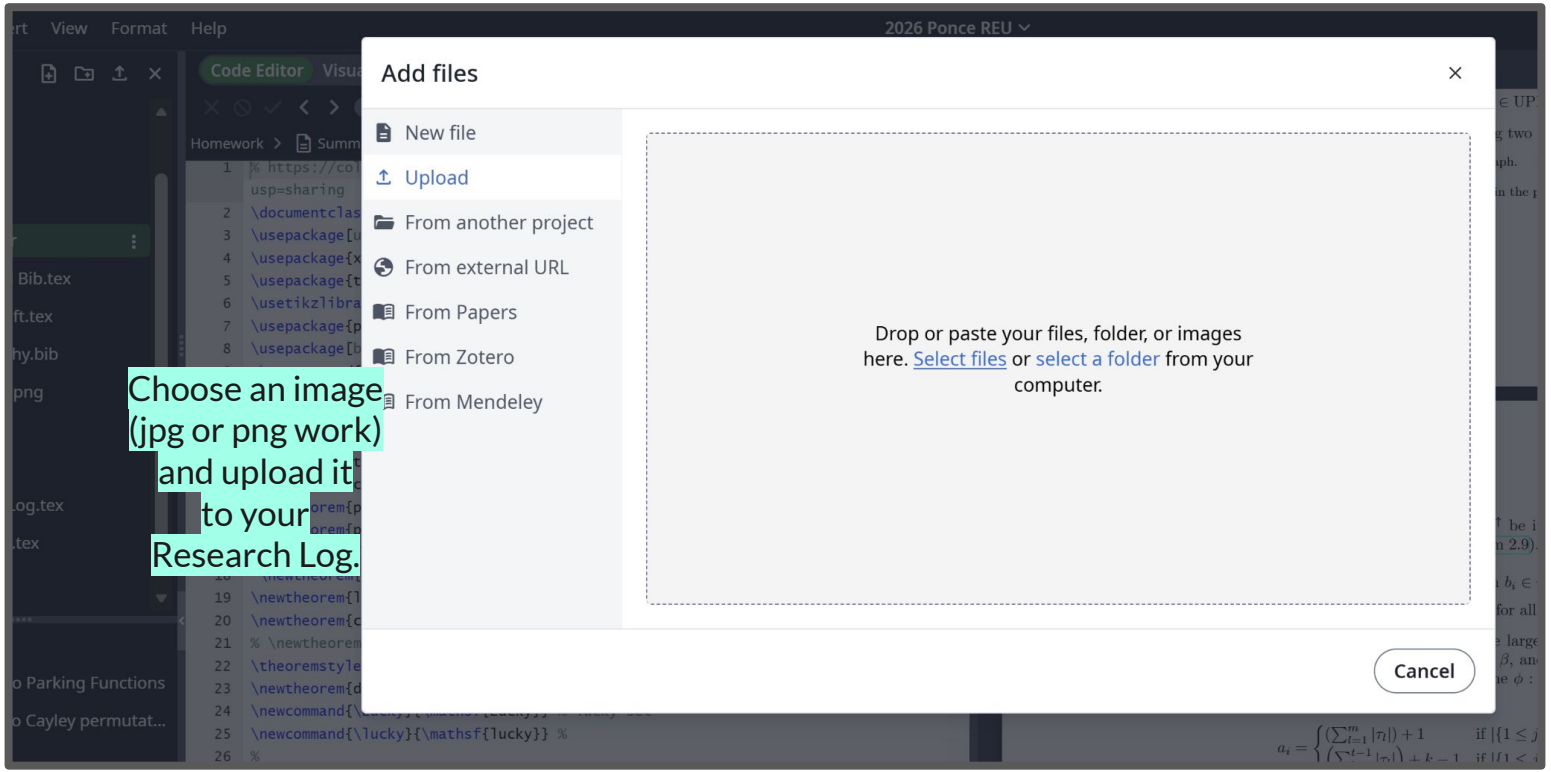
(1) Mushroom
(2) Kitten
(3) Matcha
(4) Robin

What if you want to enumerate a list of equations? Use math mode:

(1) $T \oplus S \cong T \otimes S$
(2) $f : T \longrightarrow S$
(3) $t \mapsto f(t)$
(4) $\Rightarrow f(t) \in S$

```
36
37  \begin{enumerate}
38      \item Mushroom
39      \item Kitten
40      \item Matcha
41      \item Robin
42  \end{enumerate}
43
44
45  \begin{enumerate}
46      \item $T \oplus S \cong T \otimes S$
47      \item $f: T \longrightarrow S$
48      \item $t \mapsto f(t)$
49      \item $\Rightarrow f(t) \in S$
50  \end{enumerate}
51
```

Images: Uploading

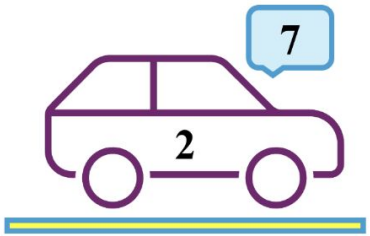


Images: Inserting, Centering, Fixing

In the file tree, my image is labeled “Car_1_2_7.png.” There are several ways to insert an image into your file, (Inserting Images - Overleaf, Online LaTeX Editor). Here is one way: First add graphicx package. Also, the [h] in line 11 tells LaTeX to keep the image *approximately* where the code is on the page.

```
1  \documentclass{amsart}
2  \usepackage{amsmath}
3  \usepackage{graphicx}
4
5  \title{Your Research Log}
6
7  \begin{document}
8  \maketitle
9
10
11 \begin{figure}[h]
12 \includegraphics[width=8cm]{Sample Folder/Car_1_2_7.png}
13 \centering
14 \end{figure}
15
16 Everyday you should type up what you have observed, ideas you have, sketch of a
   proof of your conjectures, etc. An excellent entry is an example of the object
   you are studying. Your future self thanks you!
17
18 What you should \textbf{not} do is spend endless hours designing beautiful
   graphics, tables, or diagrams. If you cannot make your illustrations in a
   reasonably short amount of time, upload an image of your drawing. In fact, it is
   a good idea to start by upload images of your drawings and only delete them once
   you have an alternative.
19 \end{document}
```

YOUR RESEARCH LOG



1

Images: Captioning and Resizing

Assignment: Resize your image and caption it.

```
6
7  \title{Your Research Log}
8
9  \begin{document}
10 \maketitle
11
12
13 \begin{figure}[h]
14 \includegraphics[width=3cm]{Sample Folder/Car_1_2_7.png}
15 \centering
16 \caption{Renegade Car}
17 \end{figure}
18
19
```

YOUR RESEARCH LOG

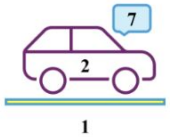


FIGURE 1. Renegade Car

Theorem, Definition, Example, Proof Environments

Assignment: create an example, theorem, lemma, proof, proposition, or definition.

```
\documentclass{amsart}
\usepackage{amsmath}
\usepackage{graphicx}

% Define the example environment
\theoremstyle{definition}
\newtheorem{example}{Example}
%\newtheorem{example}{Example}[section] will label the example 0.1
%\newtheorem{theorem}{Theorem} You can do this for theorems, lemmas,
propositions, definitions, and conjectures as well.



\title{Your Research Log}

\begin{document}
\maketitle


\begin{figure}[h]
\includegraphics[width=3cm]{Sample Folder/Car_1_2_7.png}
\centering
\caption{Renegade Car}
\end{figure}

\begin{example}
    If Car 2 wants Spot 7 and ends up parking in Spot 1, does Car 2 live in a
    parking function?
\end{example}
```

YOUR RESEARCH LOG

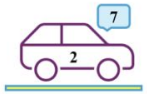


FIGURE 1. Renegade Car

Example 1. If Car 2 wants Spot 7 and ends up parking in Spot 1, does Car 2 live in a parking function?

Everyday you should type up what you have observed, ideas you have, sketch of a proof of your conjectures, etc. An excellent entry is an example of the object you are studying. Your future self thanks you!

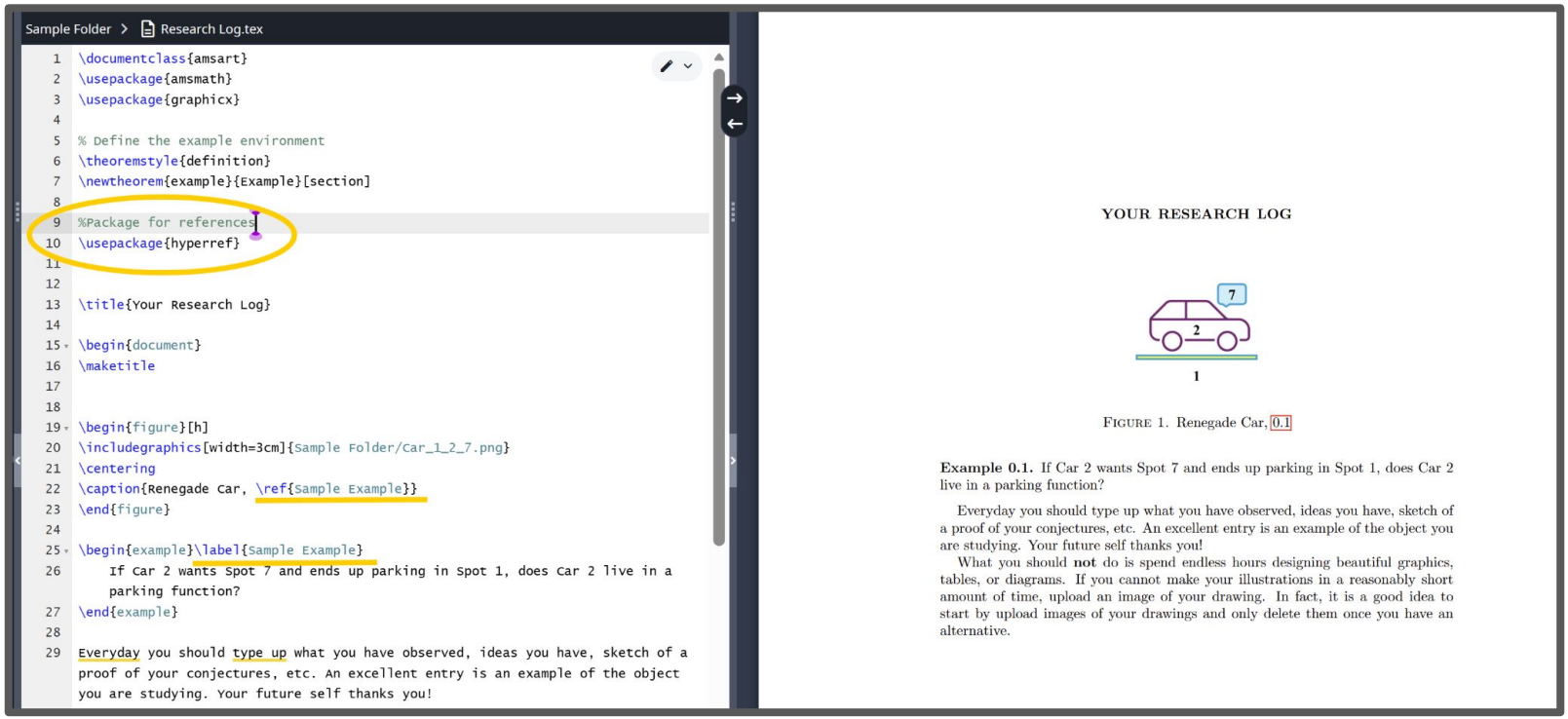
What you should **not** do is spend endless hours designing beautiful graphics, tables, or diagrams. If you cannot make your illustrations in a reasonably short amount of time, upload an image of your drawing. In fact, it is a good idea to start by upload images of your drawings and only delete them once you have an alternative.

Referencing within a Paper

Assignment: Add hyperref package to your document. Label your example and add the reference to your image's caption.

Sample Folder > Research Log.tex

```
\documentclass{amsart}
\usepackage{amsmath}
\usepackage{graphicx}

% Define the example environment
\theoremstyle{definition}
\newtheorem{example}{Example}[section]

%Package for references
\usepackage{hyperref}

\title{Your Research Log}

\begin{document}
\maketitle


\begin{figure}[h]
\includegraphics[width=3cm]{Sample Folder/Car_1_2_7.png}
\centering
\caption{Renegade Car, \ref{Sample Example}}
\end{figure}

\begin{example}\label{Sample Example}
    If Car 2 wants Spot 7 and ends up parking in Spot 1, does Car 2 live in a
    parking function?
\end{example}

Everyday you should type up what you have observed, ideas you have, sketch of a
proof of your conjectures, etc. An excellent entry is an example of the object
you are studying. Your future self thanks you!
```



YOUR RESEARCH LOG

FIGURE 1. Renegade Car, 0.1

Example 0.1. If Car 2 wants Spot 7 and ends up parking in Spot 1, does Car 2 live in a parking function?

Everyday you should type up what you have observed, ideas you have, sketch of a proof of your conjectures, etc. An excellent entry is an example of the object you are studying. Your future self thanks you!

What you should **not** do is spend endless hours designing beautiful graphics, tables, or diagrams. If you cannot make your illustrations in a reasonably short amount of time, upload an image of your drawing. In fact, it is a good idea to start by upload images of your drawings and only delete them once you have an alternative.

Referencing within a Paper

Notice that we can label and reference tables as well.

```
45
46  \vfill
47  \begin{table}[h!]
48      \centering
49      \begin{tabular}{|c | c |c |}
50          $x_1$ & $y_1$ & $z_1$ \\
51          \hline
52          $x_2$ & $y_2$ & $z_2$
53      \end{tabular}
54      \caption{Nice Table}
55      \label{Nice Table}
56  \end{table}
57
58  Go look at my nice table \ref{Nice
    Table}.
59
60
```

x_1	y_1	z_1
x_2	y_2	z_2

TABLE 1. Nice Table

Go look at my nice table 1.

Referencing Your Bibliography

To reference your bibliography, \usepackage and \addbibresource as shown to the right.

Notice that you use \cite for your bibliography, but you used \label and \ref for referencing your own work within your paper.

```
3
4  \usepackage{biblatex} %Imports biblatex package
5  \addbibresource{Bibliography.bib} %Import the bibliography file
6  %This is one of several ways to make a bibliography in LaTeX.
7
8  \title{Your Research Log}
9
10 \begin{document}
11 \maketitle
12
13
14 I want my readers to understand how relevant Bruce Sagan's work on
   chromatic symmetric functions to my current research \cite{MR5039069}.
   Now my readers can find out how to change the basis of a chromatic
   symmetric function for themselves.
15
16
17
```

I want my readers to understand how relevant Bruce Sagan's work on chromatic symmetric functions to my current research [1]. Now my readers can find out how to change the basis of a chromatic symmetric function for themselves.

Assignment

Use your LaTeX skills to write every day in your Research Log.

References, Acknowledgments

- *Linear Algebra Done Wrong*, by Sergei Treil, LADW_2017-09-04.pdf
- *Abstract Algebra*, by David Dummit and Richard Foote, 3rd edition

- Thanks to my mentors and colleagues whose work I used as examples: Dr. Pamela E. Harris, Dr. Jennifer Elder, and Kimberly Hadaway.
- Thanks to Jonathan Walker Moses for recommending the matrix generator!