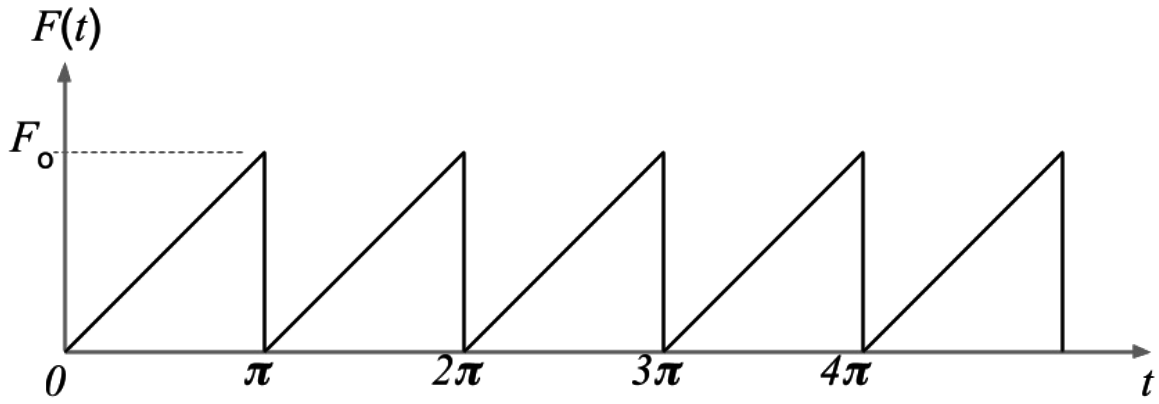
Project 6 [16 FP “Fluency Points”]:

Observe the Effect of the Number of Terms of Fourier Sum using a Google Sheet or Code.

Description:

For the following periodic forcing function:



the Fourier series representation (i.e., approximation) can be written as:

$$F(t)=\frac{F_o}{2}+\sum_{n=2,4,6\ldots}^{\infty}\frac{-2F_o}{n\pi}\cdot\sin(nt)$$

Explore the effect of the summation term by expanding it to various extents.

Specifically:

- In a Google Sheet or a code, generate at least ten graphs, each representing an extent of the sum expansion (i.e., expand the summation to one term, two terms, …, and ten terms – if not more).
- Compare your graphs to the original forcing function, shown above
  - If you use Google Sheet, then plot all graphs in a single chart, then overlay the chart on top of the original plot above.
  - If you use a code, then export all graphs to a single animated GIF, overlaying over each other as well as over the original plot.
- Draw some conclusions regarding the effect of the number of summation terms of the Fourier series on the accuracy of approximating the actual forcing function.
- Reflect on your learning and journey of working on this project.

Document your work in a Google Doc.

A PNG image of the original plot with transparent background will be provided.

Deliverable:

Present your work in a Google Doc. If you use Google Sheet for the data and plots, then include your completed chart (as an image), and also a hyperlink to your Sheet, in the Doc. If you use a code for the data and plots, then include the animated GIF along with your code (as simple text) in the Doc.

Submit the Google Doc link to Gradescope.

See Appendix A for instructions. All other file formats will be disregarded.

Rules and Format:

- File requirements
  - Your Google Doc must contain the entirety of your work for this project, including
    - a brief description of this project
    - a chart (from either Google Sheet or code)
    - either an embedded link to your Google Sheet or your entire code
    - conclusion, and
    - reflection
  - Your entire Google Doc must be in portrait orientation and has a vertical page flow
  - Your Google Doc (and Sheet, if used) must be publicly accessible, i.e., no permission required (see Appendix A below for how to set up and share your Google Doc)
  - Your Google Doc (and Sheet, if used) must not be edited after you have submitted it to Gradescope (your Google Doc/Sheet will show the last edit date to any viewer)
- Chart requirements (for both Sheet and code)
  - Your chart image must display the same axis range, for both F and t axes, for all data series (if using Sheet) or frames (if using code)
  - Your chart image must include a legend that clearly indicates the various data series
  - Your chart image must contain a title and axis labels
  - Your chart title must include your full name
  - [If using code:] Your GIF must be infinitely looping
- Spreadsheet requirements (if you use Google Sheet)
  - Your spreadsheet must include instructions for the user
  - It must allow the user to quickly change values of any input parameters such as F_o and Δt
  - It must contain a plot that dynamically updates whenever an input value changes
  - It must have only one tab; all input parameters (constants), data, and plot must be shown in the same tab
- Code requirements (if you use code)
  - Your code must be self-contained, i.e., once executed, it must create the animated GIF file without the need for any post-processing
  - Your code must contain comments throughout, including
    - a “header” stating the programming language, project number, course number, semester, your name, date, etc.

        - an explanation of each section or line of the code
    - Your code must allow the user to easily modify input parameters, such as F_o and Δt, near the top of the code
- This is an individual project
- Violation of *any* of these rules will invalidate your submission altogether – read this document carefully (srsly)!

Tips:

Projects 4 & 5, SSLQ9, as well as past and future live classes, should help.

Submission:

Submit your Google Doc link (URL) on Gradescope only. Submissions by email or other means will be disregarded.

Due Apr 5, 2021 (Monday) 11:59 pm.

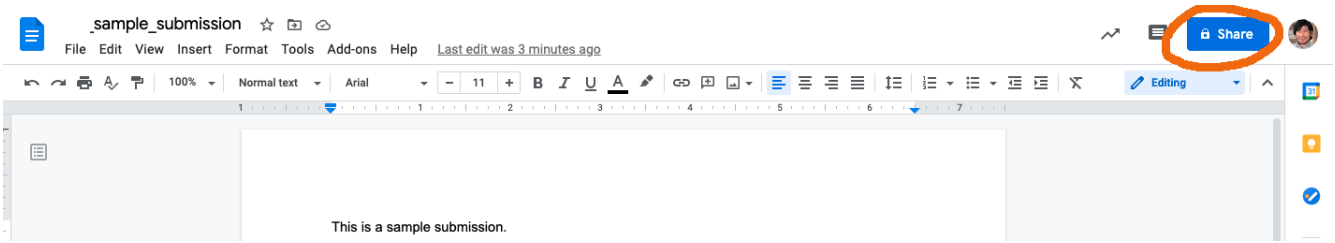
Late submissions will be subject to the “half-life” reduction policy according to the syllabus.

Grading Rubric:

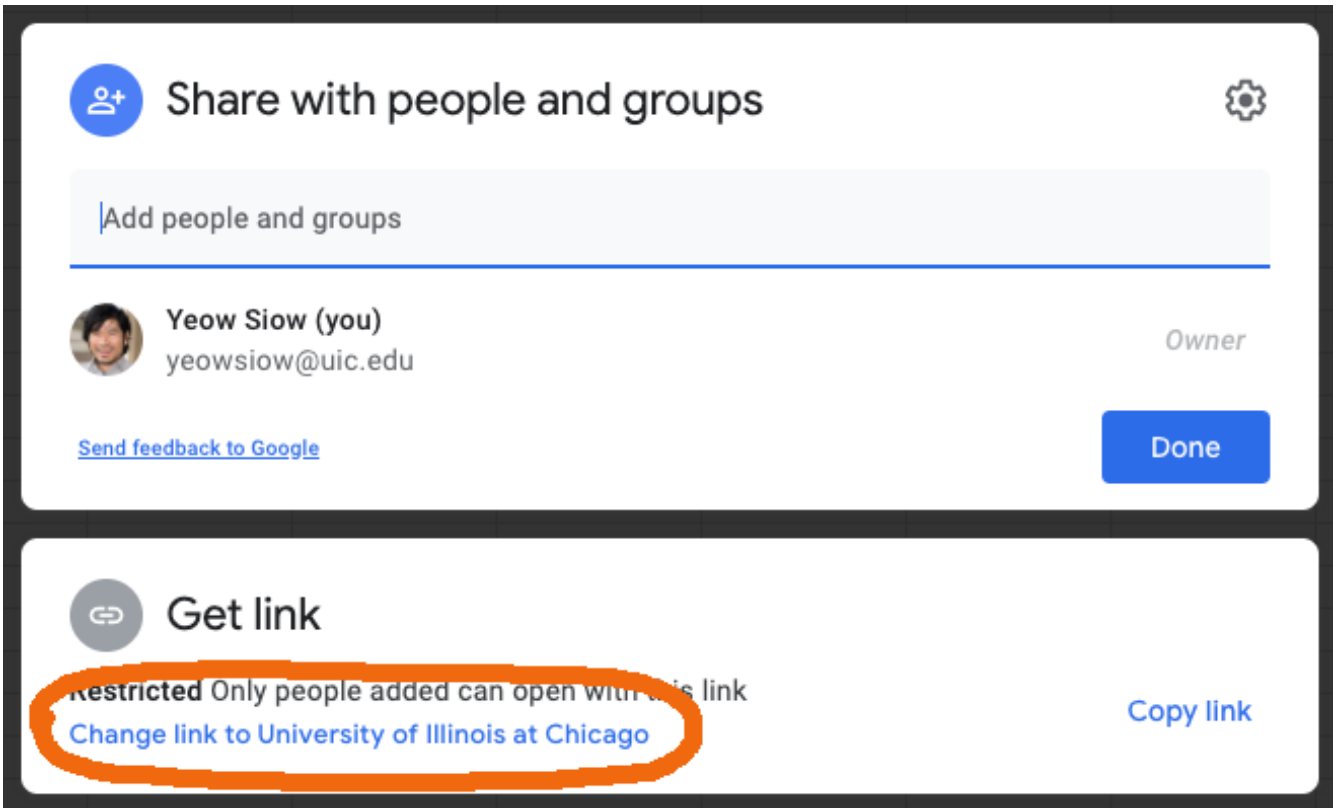
	Achievement Factor			Scaling	Max Possible
	2	**1**	**0**		
Data Authenticity, Accuracy & Robustness	Data is generated by using accurate formulas; formulas are easy to identify and understand; data has low risk of errors	Data sources are ambiguous; difficult to make sense of	Missing	2	4
Plot Effectiveness	All lines & curves are clear and well formatted; directly and unequivocally communicates the main message	Limited formatting is applied; difficult to discern the meaning of the visuals	Missing	3	6
Observation & Conclusions	Thoughtful, comprehensive, and convincing; strongly supported by the plot	Lacks substance; weak alignment with the plot	Missing	2	4
Reflection	Thoughtful and authentic	Insubstantial or vague	Missing	1	2
				Total	16

Appendix A: How to Share and Submit Your Google Doc

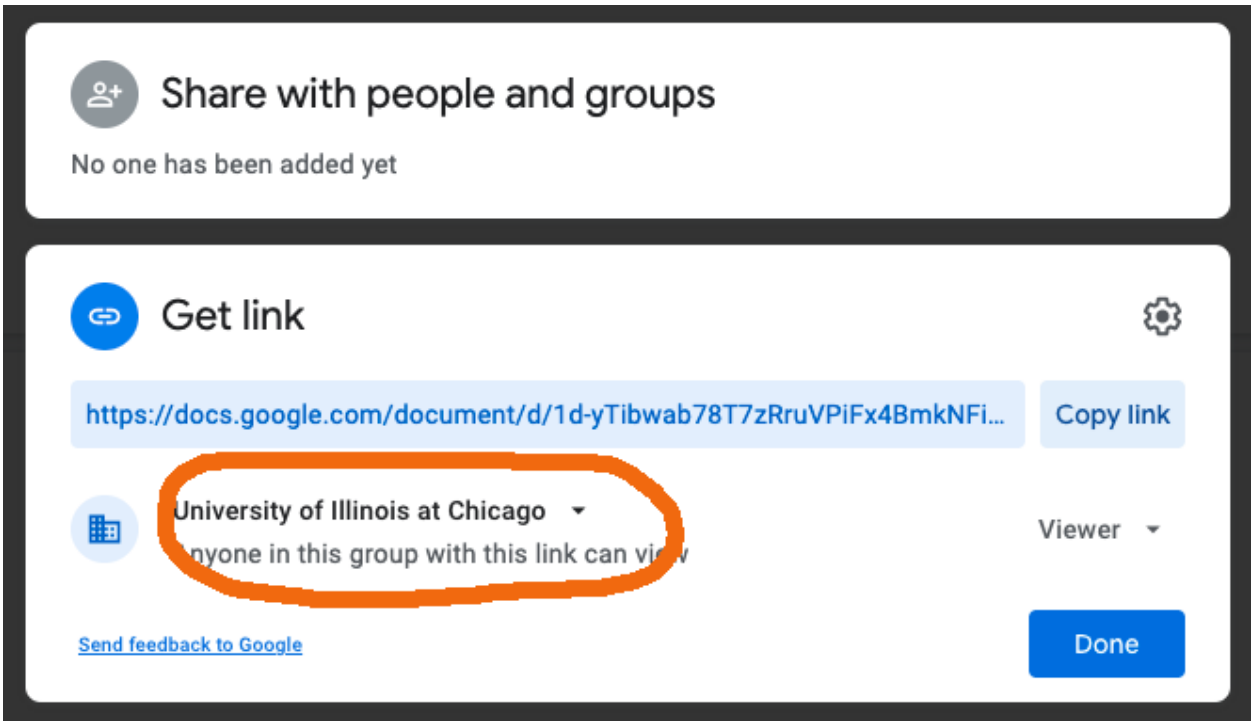
1. Sign in to your UIC account on Google. On your Google Doc, click “Share”:



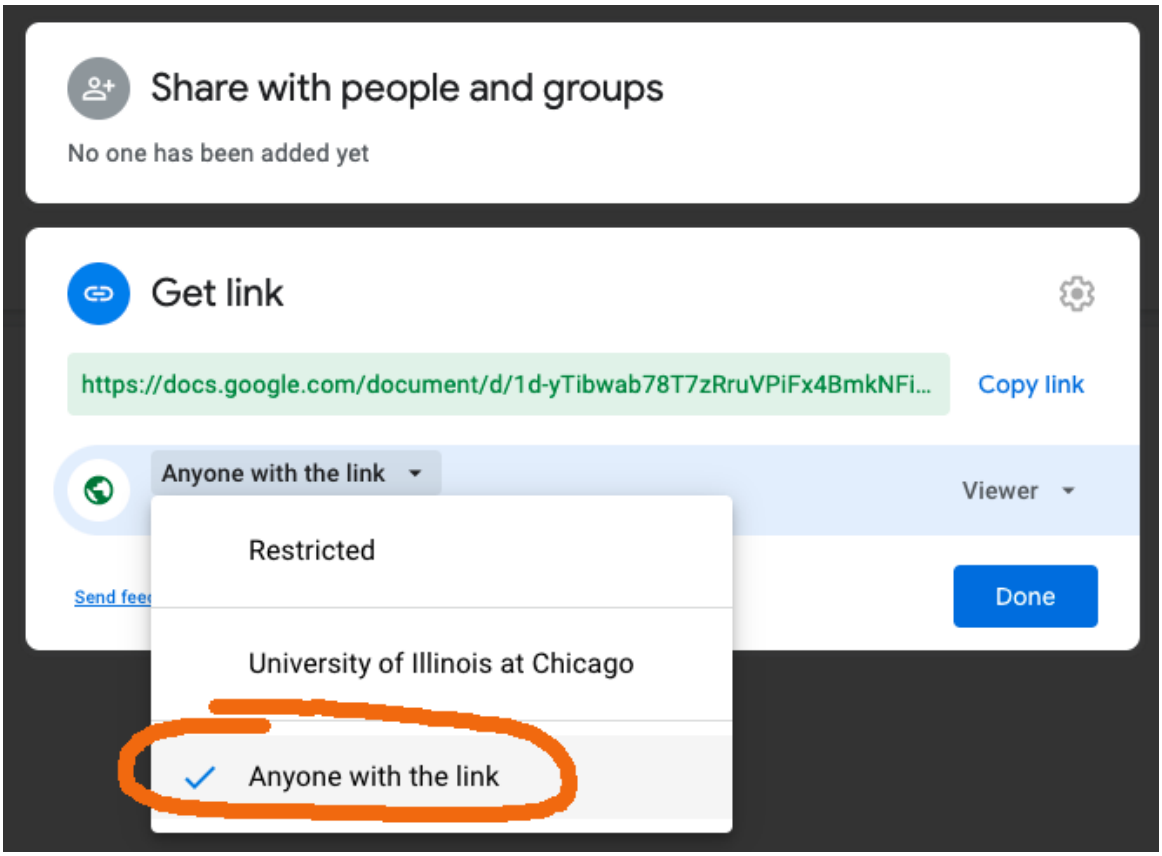
2. Under “Get link,” click “Change link to University of Illinois at Chicago”:



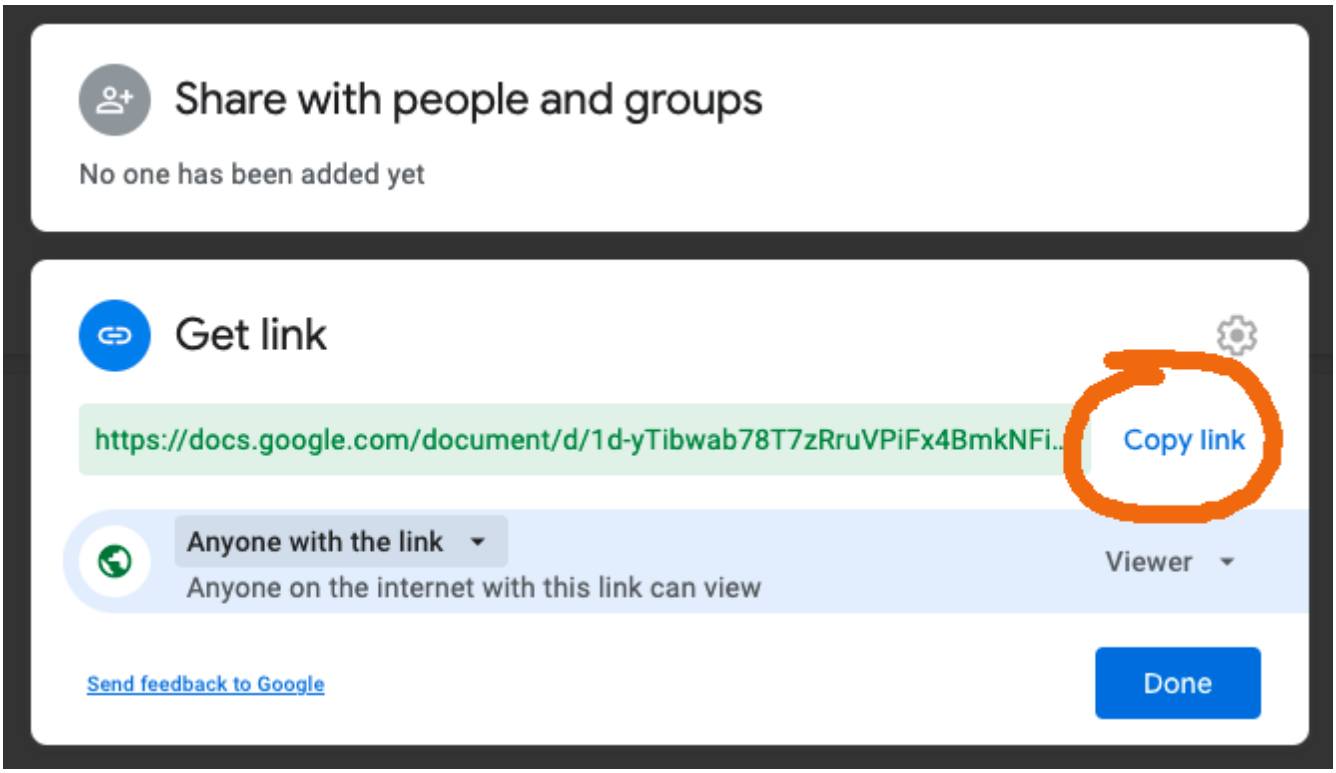
3. Click “University of Illinois at Chicago”:



4. Select “Anyone with the link”:



5. Click “Copy link” then “Done”:



6. Paste the link in Gradescope.