You have two choices for your individual project. Option 1 is described on this page, Option 2 on the next. On the third page is a **schedule of due dates, for both options**.

Option 1: Parametric Equations – art or math?

This goal of this project is simple: Create a drawing in Maple using parametric plots, polar plots, and any other fun functions you want. This is an excellent way to really get comfortable with choosing functions that do what you want them to – and as a side benefit, you will get very comfortable with Maple.

As a very basic example, try the following:
Open a new Maple document: `File - New - Document Mode`
Load the "plots" package: `Tools-Load Package-Plots`
Type:

```
p1 := polarplot(5+sin(3*theta),theta = 0 .. 2*Pi,color = magenta,scaling = constrained):[return]
p2 := plot([2*cos(t), -1+2*sin(t), t = 5*Pi/4 .. 7*Pi/4],color = red):[return]
p3 := plot([-2+.8*cos(t), 2+.6*sin(t), t = 0 .. 2*Pi],color = blue):[return]
p4 := plot([2+.8*cos(t), 2+.6*sin(t), t = 8*Pi/7 .. 13*Pi/7],color = blue):[return]
display(p1,p2,p3,p4)[return]
```

- The colon at the end of the first four command lines suppresses the output – that is, it prevents Maple from printing out the plot structure for each function. If you forget it, sometime you just get a single line saying `PLOT(...)`, but others you may get lines and lines of code!
- Make sure that at least one of your plots contains the option *scaling=constrained*. This will keep Maple from scaling your plots differently in the x and y directions. Without it, you can work hard to get something to look just the way you want it, and then when you add in another plot with a different domain and range, the shape of the first one changes.
- You should use *at least* 30 different functions in your final image.
- *The more creative you are with this, the better your grade will be.* For example, you would not earn a high grade for using just lines, circles and ellipses or only one color. Include a variety of types of functions! Try to use not only as many different types of functions, but as many ways of defining them as possible (that is, not only lines, trig functions, exponential functions, but also define some parametrically, some with polar coordinates, etc). You might want to stretch or compress a function, or try to smooth out a connection between functions. What I'd really like to see is that you come up with an idea first, and then figure out how to do it using functions. (If you use Maple's capability to plot polygons, you are not demonstrating your own understanding of functions. This might be a nice *addition*, but will not count toward your 30 functions. The same goes for Maple's "line" command, its "rotate" command, etc)
- For those of you who have had linear algebra, you know how to stretch, skew, and rotate via matrix multiplication. This gives you an easy way to manipulate any parametric plot.

  If you haven't had linear, ask me (or someone who has had linear) and we can explain it to you pretty quickly.
- We may have show-and-tell at the end of the semester where everyone can see each other's projects.
- You should turn in a printout of your final picture, and email me a copy of your Maple worksheet.
- Finally, **Have a lot of fun with this!!!!**

Option 2: Book Review

The motivation for this option is that there are a lot of cool interesting aspects of math that we won't get to in any class... but you can read about them! This is your opportunity to read about a mathematician or an area of math that you might not be exposed to otherwise.

A few possibilities include *The Signal and the Noise*, *The Code Book: The Science of Secrecy from Ancient Egypt to Quantum Cryptography*, *The Pea and the Sun: A Mathematical Paradox*, *Fermat's Enigma*, *Euclid in the Rainforest*, *A Mathematician's Apology*, *The Elegant Universe*, *Warped Passages*, *Big Bang: The Origin of the Universe*, *To Infinity and Beyond*, *The Broken Dice*, *The Equation that Couldn't be Solved: How Mathematical Genius Discovered the Language of Symmetry*, *The Road To Reality: A Complete Guide to the Laws of the Universe*, *The Man Who Loved Only Numbers*, *The Man Who Knew Infinity*, *The Liar Paradox and the Towers of Hanoi: The Ten Greatest Math Puzzles of All Time*, *Journey Through Genius*, *The Universe and the Teacup*, *Flatterland*, *The Irrationals: A Story of the Numbers You Can't Count On*, *e: The Story of a Number*, *An Imaginary Tale: The Story of "i"*, *Zero: The Biography of a Dangerous Idea*, or any book by Keith Devlin. I'd just browse through the QA section of the library ... or go to Amazon, select one of these, and then click on the other books that they then suggest to you. Be sure to *pick something that interests you!*

- **Do not choose a book you've already read** – although if you've only started the book and never gotten more than halfway through, that would be okay.
- If you begin a book and find that you are simply not finding it interesting, please feel free to switch books – just come talk to me about it first.
- Many books – *Flatterland*, *The Elegant Universe*, for instance – start out at a pretty elementary level and get progressively more and more difficult. If you choose a book that is quite long, and after a significant amount of reading you find it getting to the point where you are no longer understanding it mathematically (or having to work very hard to understand it), bring the book for me to look at, and we'll discuss whether you should keep trying to finish it or whether you've read enough at that point.

Your report should **not** be a summary of the book. Instead, you should give a critique of the book. Specifically:

- Begin with a brief one or two page overview of the book that gives the big picture.
- Address who you think the appropriate audience for the book is. Could any high school graduate read the book? Does it assume some college-level mathematical background? If so, be specific about what knowledge the author is assuming. Do you have to be an expert to enjoy the book?
- Discuss the mathematical content of the book: was it explained well? was it interesting? Did the exposition make you want to learn more about the area?
- Be sure to include a discussion of those aspects of the book which were done well, those tat were not, and (if applicable) give specific suggestions that would, in your view, improve the book.
- I have no hard-and-fast length requirements, but I imagine that in order to accomplish all of the above, the length will be at least four or five typed pages long.

Important Dates:

- **Friday, March 8:** Let me know by e-mail which option you're choosing. (Doing this on time will count for 2% of your project score.)
- **Friday, March 22:** Option 1: give me a rough sketch of your plan, along with at least 2 functions; Option 2: e-mail me the title of the book you've chosen, and have read at least 1 chapter. Let me know how far you are, and include a very brief reaction to what you've read. (An additional 3% of your project score).
- **Wednesday, April 3**: Option 1: turn in a more detailed hand-drawn sketch of your final project and also a print out of your Maple worksheet containing a *rough* idea of your image (with at least ten functions). Option 2: you should have read an absolute minimum of 75 pages. Turn in a progress report – I'd like to know about how far you are in the book and how reading the book is going (please don't exaggerate. If you *haven't* read those 75 pages, and it's because the book is very dense mathematically, let me know that!) (5% of your project score.)
- **Friday, April 26:** Final version due. Option 1: final picture and Maple file (printed out, if used PC); Option 2: final draft of your book critique. (90% of project score.)