

Advanced Topics in Math

Information for Spring Projects

General Guidelines

- Do at least one project individually and at least one with a partner. Don't do all projects with the same partner.
- Projects need to fit at least one category and type listed below.
- If you want to work in a group of 3 or more, you must get approval.

Make sure all work evaluates free of errors.

Complete the "Reflection" section at the end of your notebook and your "Response to Peer Review."

For each project choose a "Category" and a "Type." Do a variety of projects within the semester.

Categories

- **Interdisciplinary Project:** Choose a topic from another subject area that has a mathematical connection. This could even be a project for another one of your classes. Topics could be science, social science, art, music, sports, etc.
- **Pre-Calculus Project:** Choose a topic from Pre-Algebra, Algebra I, Geometry, Algebra II, or Pre-Calculus to review. Perhaps you know someone in one of these classes and you could use your work to help teach them something.
- **Calculus or Linear Algebra Project:** Choose a topic from Calculus AB, BC, C, D or Linear Algebra to review or learn about in more depth. Revisit your course notes or the textbook for ideas or see me.
- **Reading & Research:** Read a book, article, paper, or chapter from my library or the school library. You may check out materials from me. Learn about an idea new for you in mathematics or an application. You may do research, including Internet research, beyond what you find in my library, however you are strongly encouraged to look for inspiration in published print resources.
- **Expanding an Old Assignment:** Assignments should give you ideas for projects. If there is an old assignment that you really enjoyed or inspired you to do something else, you can go back and elaborate on it. Note that as a "project" your work needs to be significantly improved, more detailed, and more complex than the original assignment.
- **Mathematica Functionality:** Learn something new about what *Mathematica* can do. Figure out how to apply it in interesting ways and share what you learn with others.
- **Cultural Connection:** Choose a culture or country that his meaningful to you from your own background, family history, or one you would like to learn more about. Use a broad range of approaches to learn and illustrate different things. Needs to be more than just copy/pasting informational items. Do your own analysis, illustrations, coding, summaries, image processing, etc.
- **Client-Based Project:** Find someone who could benefit from *Mathematica* or who wants to use it for something, but needs help. A client can be a teacher, family member, friend, neighbor, etc. Your client should be an adult.
- **Special Equipment:** Learn how to use a Game Controller, SpaceNavigator (3D Mouse), Parallel Computer, 3D printer, Neural Networks, or something else (?) you have to create and/or control something. Share your knowledge!
- **Game:** Games have been popular projects in the past, but they can be challenging and often need additional work with dynamic interaction. Try a few things to see if the fundamentals work before committing to the project.
- **Own Design:** An idea that does not fit any above category. Do some preliminary work to see if the project is reasonable. All projects of your "own design" need approval before doing too much.

Information for Spring Projects (Continued)

Types

- **Computational Essay:** Create a notebook that captures your ideas and what you have learned. This could later be something shared outside of the class. Format your work nicely with any needed initialization cells, text explanations, and a logical flow so that it speaks for itself.
- **Demonstration:** Design a Demonstration following the guidelines on the Wolfram Demonstrations web site. Submit it for publication and edit as needed. Goal: Get your work published!
- **Lesson:** Design a lesson for our class or another audience that teaches something. Schedule a presentation to teach your lesson to the group.
- **Worksheet or Handout:** Make a worksheet or handout that can be used by other students or teachers. Format your work so it can be printed and photocopied easily (try to keep it to one or two pages or perhaps create a series of related worksheets). You may choose to use Word along with *Mathematica* to make formatting easier.
- **Own Design:** An idea that does not fit any above type. This could include something artistic or designing a web page or web site. It may be doing something that does not use *Mathematica*. Try some preliminary work to see if the project is reasonable. All projects of your “own design” need approval before doing too much.

Learning Priorities

As you develop, review, and/or revise a project consider relevance, content, methods, organization, discourse, and challenge. These learning priorities are described below and will be the basis for grading projects.

- **Relevance**
What is the purpose of your project? Why is your topic or type of project important or special to you? Is this project interesting and/or meaningful? Does it serve a purpose for others?
- **Content**
What subject topics will you incorporate into your project? Will your work draw from multiple disciplines? Does the project include the appropriate information accurately? Is the content explained clearly and thoroughly (including any directions for use)?
- **Methods**
How do you plan to develop and/or explore the content through working on your project? How do you plan to incorporate different methods of representation (symbolic, numerical, graphical, and verbal) into your project? Does the project exhibit mathematical and/or scientific thinking?
- **Organization**
How will the content be organized within the project? For group projects, how will you organize the work to be divided among group members? Is the project exhibited in a clear, well-organized format? Does the work follow standard formatting guidelines?
- **Discourse**
How do you plan to share your project with the class and/or with others outside of class? How will you use critique on your project to help guide you through revision and subsequent exhibition? Does the project incite discussion to promote learning?
- **Challenge**
What do you think will be the biggest difficulty you will encounter in completing this project? How do you plan to meet that challenge? Is this project challenging for the author(s)? How will you learn from this project? Is there a clear demonstration of growth?

