

# Math 88S: Mathematics & Movies

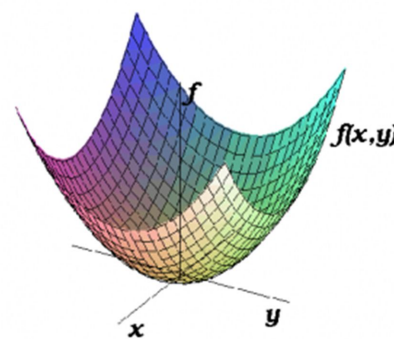
## My Objectives

Math is really cool, and I have never doubted it. It's one of the oldest fields, and is nicknamed "the mother of all sciences". However, not everyone shares the same affinity for the material. It is hard for a lot of people to see past the jargon and overcome their "mathaphobia", but my objective is to show students how much fun and "hip" math really is. I'm hoping to convince students that there is so much more to it than really meets the eye, or at least your textbook.

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## Course Description

Mathematics can often be mired in long computations and abstract concepts, and sometimes it can be hard to recognize the beauty and diversity of the subject. Moreover, many of these concepts are reached much later in mathematics, but this should not stop students from getting exposed to it now. Students will use movies as a framework of understanding for various higher level topics in mathematics each week. By relating these concepts to a familiar medium, students will leave this seminar recognizing how the many abstract concepts can indeed be described by everyday situations, as demonstrated in the chosen movies.. Designed for both majors and non-majors; course only requires basic understanding of high school mathematics (below calculus).



## Course Requirements

This is a 1-unit P/NP seminar that meets 1 hour per week. Students are expected to attend each seminar, but given one absence; additional missed classes are a case-by-case basis. In addition, since each week will be based on a different movie; students will be expected to watch or be very familiar with said movie. Small interactive assignments may be given some weeks that are designed to further understanding or provide additional enrichment to the week's topic. Assignments vary, but may be DIY demonstrations or short reflections.

## Course Expectations

Students are expected to participate and maintain classroom discussions. In addition, students are encouraged to create and ask questions, as well as promote a positive, healthy atmosphere for discussion of ideas. Brief articles or passages will be given for students to familiarize themselves with each week's topic before class. Students are not necessarily expected to fully understand the reading, but will be expected to get a general introduction.

# Schedule

## Week 1: The Fault in Our Stars and Infinity

Infinity presents many interesting phenomena in mathematics. We will focus on Cantor's theory that some infinities are bigger than others, the idea of size for infinities, limits, and what it means to be infinite.

## Week 2: Mean Girls and Graph Theory

This popular movie provides a story line for some theories in graph theory, such as Regina George Numbers. In addition, we can learn how to model the spread of rumors and how they proliferate quickly.

## Week 3: Flubber and Topology

Topology is sometimes so abstract that it is hard to visualize, but using Flubber as a medium enables us to have a visual aid. Throughout the movie, Flubber actually demonstrates various critical theorems in topology.

## Week 4: Harry Potter and Game Theory

We want to compare Prisoner's Dilemma and the decision making and outcomes in Harry Potter and the Prisoner of Azkaban. We can mathematically calculate the payoffs for the decisions made in the movie.

## Week 5: The Gambler and Probability

We will demonstrate the probability that goes behind certain games of chance presented in the movie, such as poker, blackjack, and roulette and use as an example to demonstrate various theories in statistics.

## Week 6: Interstellar and Physics

Physics and mathematics are heavily intertwined. We will focus on some of the theories used in the movie, specifically, wormholes, black holes, special relativity, and discuss their significance in modern research.

## Week 7: The Imitation Game and Cryptography

Discussion of how the Enigma Machine worked, the significance during World War II, and basic concepts of cryptography. In addition, we will discuss how this relates to modern computer security.

## Week 8: Sherlock Holmes and Proofs

Introduction to formal proof solving techniques and language, as well as developing logical arguments. Through Sherlock Holmes actions in scenes, we will apply his logical arguments in a mathematical context.

## Week 9: The Matrix and Matrices

Matrices are an extremely important concept in mathematics; a building block not only for algebra, but also in many applications.

## Week 10: Frozen and Computer Graphics (possible guest lecture)