

FRS 157
MATHEMATICS AND ASTRONOMY
FALL 2022

Instructor. Eden Prywes

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Office Hours. Fine 310, Wednesday 1:00 PM - 2:00 PM or by appointment.

Classroom. Holder Hall B31.

Time. Mondays and Wednesdays 11:00 AM - 12:20 PM.

Course Webpage. <https://math.princeton.edu/~eprywes/F22FRS/>

Course Description. This seminar aims to study the applications of mathematics to astronomy throughout human history. Astronomy has often been the main motivation for mathematical developments starting from the basic study of geometry all the way to calculus and differential geometry. We will survey the major achievements in these two fields.

Scientific interest in astronomy goes back to the birth of civilization. For this reason, astronomy serves as an excellent lens for examining mathematical development. The main questions this seminar will set out to answer are: How was mathematical thought influenced by civilizations' interests in astronomical phenomena? What were the main drivers and impediments to the development of these two fields? How did the culture and beliefs of each civilization affect the study of mathematics and astronomy?

The mathematics required for understanding many of the astronomical phenomena that can be observed with a simple telescope are no more complicated than what is learned in a high school course. For this reason, it is very appealing to carefully see what simple tools can be used to understand complicated problems. We will be able to calculate the circumference of the Earth, the distance of the moon and the sun to the Earth, the velocity of planetary orbits and many other similar issues. Some of these discoveries rely on clever observations and simple computations while others involve many observations and rigorous scientific study. We will be able to see the development of scientific thought throughout History.

The course will begin with the astronomy and mathematics of the ancient Babylonians. It will then proceed through the classical Greek astronomers ending with Ptolemy, who popularized the geocentric view of the solar system. We will then study the Islamic astronomers who modernized the way we think about mathematics. After this we will cover the main astronomers of the heliocentric theory, including Copernicus, Kepler and Galileo. We will then discuss the Newtonian model of the solar system and end with Einstein's theory of General Relativity.

[Registrar description](#)

Assignments. There will be weekly problem sets due on Monday in class. You may work with other students on the problem sets but you must write up your own solutions. Late assignments will not be accepted. The lowest scored problem set will be dropped.

Quizzes. There will be 4 in-class quizzes during the term. These quizzes will occur over half of the class and cover the recent topics of the course.

Final Exam. The final exam date and location will be set by the course registrar.

Grading.

- Assignments - 30%
- Quizzes 20%
- Class Participation - 30%
- Final Exam - 20%