Preface

The measurement of everything is human—*Protagoras*

Before we start we would like to make some disclaimers.

Disclaimer ❶ Although the style of the course is one of focusing on some of the individuals in the history of mathematics, we deeply believe that although individuals matter greatly in history, there are other forces—intellectual, material or economical—that are much more powerful. Explicitly, for example, we will state that Calculus was discovered (or created, or invented) by **Newton** and **Leibniz** independently, but actually we do not have the time to indicate how much their ideas were based on previous work by a multitude of others, and that these ideas behind their creation were around for at least half a century before either was born. Ultimately, we believe that if **Leibniz** and **Newton** had not existed, Calculus would have been discovered (or created, or invented) in any case.

Disclaimer ❷ Mathematics is one of the oldest intellectual pursuits of mankind, and as such, we do not have the time to explore its complete history. We will stop at the end of the 17^{th} century, but even so we do not cover all the cultures equally. Some ancient cultures have more pertinent materials readily accessible to us than other cultures. This is particularly true of the Hindus and Islam, who made major contributions to Western Mathematics, yet what is accessible to us is rather limited. Furthermore, throughout the times all cultures have had to develop and use mathematical tools, yet we do not have time in one semester to discuss, except briefly, many of them, including the Chinese who have a long and illustrious history in mathematical activity. We regret this shallowness.

Disclaimer ❸ There are no women among the list of personalities that we study in the course. First, we restrict ourselves to roughly the top 50 names in the history of this old subject during the period, hence the sieve is very severe. Second, social conditions have occurred through the ages where women were not encouraged to participate actively in the pursuit of mathematics and other intellectual activities (for example, if we did the history of art, we would be in a similar dilemma.) Fortunately, some of these conditions have changed, and this course has a sequel that covers the nineteenth and twentieth centuries, where more of a gender diversity occurs.

Disclaimer ❹ Notation has been crucial in the development of mathematics. We will pay very shallow attention to it. Although we will try to understand some of the modes of thinking in the past, we will not have the time, often, to present proofs that are in the original mode of thinking, nor in the original notation.

Disclaimer ❺ There are to be many proofs in this course, and a wide variety of techniques will be used. **What is a proof?** Very loosely put, a proof is a process by which the speaker or writer attempts to convince others of some claim. It naturally does depend on the audience, and the proponent should be aware of this. The basic structure of a proof is: **given these premises, let me show you why this (a new, perhaps unexpected) consequence follows.** Although most of the time the conclusion is clear, the assumptions may be hard to pin down. However, as long as the audience accepts the steps we may be safe. Personally, I have usually found that if I can honestly convince myself, then I can convince others. The key word is **honestly**. It is often the case that the frustration that goes hand-in-hand with the process of discovery will gnaw at one's core of integrity, and then crucial points will be sloughed off just to get the process over. A brief example of the venting of this frustration is the statement by **Saccheri** (1667-1733) who at the time was very close to developing non-Euclidean geometry, yet frustrated he proclaims:

> **The Hypothesis of the Acute Angle is absolutely false, being repugnant to the nature of a straight line.**

The lack of objectivity in the claim is apparent since no explanation for it is given except **being repugnant**. The nature of argumentation has changed through the years and although some seem comical (like the one given below), we should always keep the perspective that what we are doing is not absolute. We mention a historical case. **Galileo Galilei** (1564-1642) was one of the first scientists to use the telescope. He used it both to make money with and to look up in the skies. An amazing thing happened when he looked up. From ancient times people had believed that there was the Earth, the fixed stars and seven wandering stars (or planets): **the Sun, the Moon, Mercury, Venus, Mars, Jupiter and Saturn.** But when Galileo looked up at Jupiter, he saw that it had satellites of its own. When he proclaimed this to his world, many people were upset and even refused to look up through the telescope. A contemporary astronomer of Galileo gave the following **proof** of why Jupiter had no satellites:

> There are seven windows in the head, two nostrils, two ears, two eyes and one mouth; so in the heavens there are two favorable stars, two unpropitious, two luminaries, and Mercury alone undecided and indifferent. From which and many others similar phenomena of nature such as the seven metals, etceteras, which it were tedious to enumerate, we gather that the number of planets is necessarily seven... Moreover, the satellites are invisible to the naked eye and therefore can have no influence on the earth and therefore would be useless and therefore do not exist.