Hypatia of Alexandria was born sometime between the years 350 to 370 AD in Alexandria of Egypt. She was the only daughter of Theon of Alexandria; no information exists about her mother. "Hypatia may have had a brother, Epiphanius, though he may have been only Theon’s favorite pupil.” Theon did not want to force his daughter to become the typical woman described by historian Slatkin when he wrote "Greek women of all classes were occupied with the same type of work, mostly centered around the domestic needs of the family. Women cared for young children, nursed the sick, and prepared food.” Instead he educated her in math, astronomy and philosophy, as well as in different religions. Theons desire that his daughter be different from the mold that society created for women influenced the rest of Hypatias life.

Eventually Hypatia became a teacher herself. She instructed her pupils, who were both pagans and Christians, in math, astronomy, and philosophy, focusing mostly on Neoplatonism. She also held lectures on various topics, often drawing many eager listeners. Her greatest contributions benefitted the fields of mathematics and astronomy. By 400 AD, she became the head of the Platonist school in Alexandria. "Hypatia, on the other hand, led the life of a respected academic at Alexandria’s university; a position to which, as far as the evidence suggests, only males were entitled previously.” Hypatia took many of Platos ideas as personal applications, choosing even to live a life of celibacy. Furthermore, Hypatia wrote three commentaries and worked with Theon on several books. She was dedicated "to preserve the knowledge of the past through a turbulent time.” In 415 AD she was taken from her chariot, beaten to death and her remains were burned. "The most detailed accounts we have of Hypatia’s life are the records of her death. We learn more about her death from the primary sources than we do about any other aspect of her life,” wrote the historian Deakin concerning Hypatia.

Hypatia’s Mathematical Works

Hypatia wrote three commentaries; one on the Conics of Apollonius of Perga, the second on the Arithmetica of Diophantus of Alexandria, and the third on the Astronomical Canon. Using the material of these books, Hypatia was able to improve her students ability to understand difficult concepts. She advanced the idea of hyperbolas, parabolas and ellipses by working on the conics section. The commentaries written by Hypatia made certain mathematical topics more understandable, but, sadly, many "of her works that were housed in the library of Alexandria were destroyed by Arab conquerors their existence known only through letters exchanged between her contemporaries.”

Contrary to popular belief, Hypatia did not invent the hydrometer or the astrolab. Both of these existed before her time; nevertheless, she was skilled in the use and construction of these instruments. This fact is known because Synesius, a former student of Hypatia, writes a letter to his former teacher to ask for help on how to build a hydrometer in order to diagnose his illness.

Her interest in astronomy is shown by her commentary on the Astronomical Canon and her collaboration with her father on the books of the Almagest by Ptolemy. Some scholars believe Hypatia made advances in astronomy because she charted the motion of the moon, the stars and other heavenly bodies.
Collaboration with Other Scholars

Theon, a famed mathematician and astronomer, was the last director of the museum before it was destroyed in A.D. 391. He and his daughter Hypatia worked tirelessly in the preservation of older mathematical texts. Hypatia helped her father to compile his eleven part commentary on the *Almagest* as well as his commentary on Euclid’s *Elements*. "Theon wrote a note in a surviving commentary on Book III of the *Almagest* indicating 'my philosopher-daughter Hypatia’ contributed to this later edition.” After the museum was demolished, many scholars left to study in other cities.

Historical Events that Marked Hypatia’s Life

Soon after its founding by Alexander the Great, the city of Alexandria became a culturally and religiously diverse city. At the center of the city was a museum; this institution was basically a university containing a great library that housed about 500,000 scrolls. Scholars from around the world came to this institution to study, learn from professors, and produce various works.

Hypatia lived during a time when several religious beliefs clashed with each other. In A.D. 391 the museum was destroyed by Christians, and many scrolls were lost forever. After this event, most scholars left the city of Alexandria in search of other places where they could continue their studies without endangering their lives. However, some scholars decided to remain in Alexandria; Hypatia was among those who chose to stay behind.

Some of the works that were saved before the museum was burned down were then moved to Serapeum, a pagan temple. Later that year, the Serapeum was burned down and the rest of the works, including Hypatia’s, were lost. After the museum was destroyed and the majority of pagan scholars left the city, there was a short time of peace. Nevertheless, fighting broke out again. In A.D. 415 at a publication of an edict by the prefect Orestes, the Jews saw a Christian spy who supposedly was inciting the crowd to rebel. The Christian was taken and publically tortured. Archbishop Cyril threatened to harm the Jews if they refused to leave the Christians alone. His menaces only enraged the Jews who devised all sorts of plans to eliminate the Christians. The Jews "having agreed that each one of them should wear a ring on his finger made of the bark of a palm branch, for the sake of mutual recognition, they determined to make a nightly attack on the Christians. They therefore sent persons into the streets to raise an outcry that the church named after Alexander was on fire. Thus many Christians on hearing this ran out, some from one direction and some from another, in great anxiety to save their church. The Jews immediately fell upon and slew them; readily distinguishing each other by their rings. At daybreak the authors of this atrocity could not be concealed: and Cyril, accompanied by an immense crowd of people, going to their synagogues – for so they call their house of prayer – took them away from them, and drove the Jews out of the city, permitting the multitude to plunder their goods. Thus the Jews who had inhabited the city from the time of Alexander the Macedonian were expelled from it, stripped of all they possessed, and dispersed some in one direction and some in another.”

The Christians considered Hypatia a stumbling block because supposedly she kept others from accepting the faith. To remove this opposition in their attempt to spread Christianity, a group of zealots took Hypatia from her chariot as she was on her way home and lynched her and incinerated her remains.
Significant Mathematical Progress during Hypatia’s Lifetime

"Hypatia and her father Theon were probably the foremost mathematicians in the Roman Empire, and most likely the world, during their lifetimes; but that doesn't mean they were great mathematicians in the same way as Euclid and Diophantus. They are best understood in the context of the times. The famous Museum was dying; the Great Library dispersed and diminished. Only a tiny elite studied the great mathematicians and conserved their work in a time of rampant anti-intellectualism. Faith and astrology were more important to everyday people than math and astronomy; and much more accessible."

Unfortunately, not much progress that was made in Hypatia’s lifetime. Even before the library was destroyed, the decline of knowledge had already begun. To further aggravate this decline, the museum with its books was destroyed and even more information was lost. After Hypatia’s death, most of the remaining scholars left Alexandria to explore other parts of the world, and, some of her students moved to Athens.

Connections between History and the Development of Mathematics

During Hypatia’s life most of the scholars were pagans because Christianity was still in its early stages of development as a faith. When Emperor Constantine the Great converted to Christianity, the religion gained momentum. Due to religious differences, fights broke out throughout Alexandria between Jews, Christians and pagans. In A.D. 391 Emperor Theodosius prohibited paganism; Archbishop Theophilus under the emperor’s decree destroyed the museum and pagan temples, including the Serapeum. Due to persecution, the majority of pagan scholars fled for their lives to other cities such as Athens.
Significant Historical Events around the World during Hypatia’s life

A.D. 312 - Roman empires are combined into one by Constantine the Great

A.D. 313 - Christianity is legal because of the Edict of Milan

A.D. 325 - Christian doctrine is outlined by the Council of Nicaea

A.D. 351 - The Roman Empire is joined together into one empire again after a civil war

A.D. 360 - Huns enter Europe

A.D. 395 - The Roman Empire is divided into two parts

A.D. 395 - All religions banned except Catholic Christianity

A.D. 407 - Roman troops leave Britain

A.D. 410 - Visigoths plunder Rome

A.D. 433 - Huns attack Roman territories

A.D. 439 - Vandals occupy Carthage

A.D. 455 - Vandals obliterate Rome

A.D. 476 - End of the Western Roman Empire

A.D. 486 - Romans vacate Gaul
Hypatia’s Role in Society

Hypatia lived in a time when only men had professions while most women took care of their homes and families. She did not take up this culturally normal position, nor did she work as a dyer or a tentmaker, which would have been viewed as a more esteemed occupation for a woman. Instead, she became an intellectual at the university. She gave public lectures and “dressed in the clothing of a scholar or teacher rather than in traditional women’s clothes, and drove her own chariot in order to move freely around the Empire. She would don a philosophers cloak and preach freely about Plato or Aristotle.”

As member of the university, Hypatia had access to all the scrolls housed at the library, of which she no doubt took advantage so that she could increase her knowledge in other areas. Socrates wrote “Hypatia, daughter of the philosopher Theon, who made such attainments in literature and science, as to far surpass all the philosophers of her own time... For all men on account of her extraordinary dignity and virtue admired her the more.”

Damasius, a philosopher, wrote “Hypatia’s style was like this: she was not only well-versed in rhetoric and in dialectic, but she was as well wise in practical affairs and motivated by civic-mindedness. Thus she came to be widely and deeply trusted throughout the city, accorded welcome and addressed with honor.” While some people esteemed Hypatia and sought her advice in political, scientific and mathematical matters, not all citizens of the city shared their view. Others considered Hypatia a witch who “was devoted at all times to magic, astrolabes and instruments of music, and she beguiled many people through (her) Satanic wiles.”

“She was a mathematician and astronomer in her own right, writing commentaries of her own and teaching a succession of student from her home.” Her students were both Christians and pagans. She had great influence in Alexandria because of this, and many of her students were from prominent families who later became leaders in the government.

Synesius, one of Hypatias Christian students, later became the Bishop of Ptolemias, a city in present day Libya, and wrote several letters to “the most holy philosopher”. He thought highly of his teacher and received “the fruitful wisdom of Hypatia”. When Hypatia discontinued her correspondence with Synesius, he wrote the following in his last letter, showing his admiration for his pagan teacher: “But now your silence has been added to the sum of my sorrows.” Synesius died two years before Hypatia.

Orestes, another one of Hypatia’s pupils, became the prefect of Alexandria. After the Jews were expelled from the city by the Christians, Bishop Cyril “sent persons to Orestes who should mediate concerning a reconciliation: for this the people had urged him to do. And when Orestes refused to listen to friendly advances, Cyril extended toward him the book of gospels, believing that respect for religion would induce him to lay aside his resentment.” When Orestes refused to be appeased, and a group of monks accused Orestes of being a pagan “and a certain one of them named Ammonius threw a stone at Orestes which struck him on the head and covered him with the blood that flowed from the wound.” Ammonius was publicly tortured “which was inflicted with such severity that he died under the effects of it.” Orestes eventually recovered and was extremely wary from then on.

Because it was known that Hypatia “had frequent interviews with Orestes” and was trusted by him, “it was calumniously reported among the Christian populace, that it was she who prevented Orestes from being reconciled to the bishop. Some of them therefore, hurried away by a fierce and bigoted zeal, whose ringleader was a reader named Peter, waylaid her returning home, and dragging her from her carriage, they took her to the church called Caesarion, where they completely stripped her, and then murdered her with tiles. After tearing her body in pieces, they took her mangled limbs to a place called Cinaron, and there burnt them.”
Remarks

Hypatia is considered by many scholars to be the first woman mathematician and astronomer. She contributed to several fields of study such as mathematics, astronomy, philosophy. She wrote commentaries on the *Conics* of Apollonius of Perga, the *Arithmetica* of Diophantus of Alexandria, and the *Astronomical Canon*. Her work clarified complex mathematical concepts. Hypatia collaborated with Theon, her father, on several books. The fourth volume of the *Almagest* is considered by some to be entirely her work.

Moreover, Hypatia recorded the path of heavenly bodies. She was a well-known lecturer and a respected teacher, for many prominent and wealthy families sent their sons to learn under Hypatia. Hypatia lived in a time when the city of Alexandria was in a religious and political turmoil. "Almost alone, virtually the last academic, she stood for intellectual values, for rigorous mathematics, ascetic Neoplatonism, the crucial role of the mind, and the voice of temperance and moderation in civic life."

Hypatia was the only female scholar at the time and a translation of the *Suda Lexicon* describes her as very beautiful and attractive; despite this fact, she remained a virgin, although the very same source, the *Suda Lexicon*, says she was the "wife of Isidore the philosopher".

Hypatia was an influential figure in the city to the point that "when an archon was elected to office, his first call was to her". Because of the position she held, Christians believed that Hypatia hindered other pagans from accepting Christianity. In order to remove this obstacle in their political agenda, group of monks dragged Hypatia from her chariot, beat her to death with tiles and burned her body.

Today, Hypatia is still an inspiration today to women around the world, especially to those in fields where women are considered or treated as the minority. Her death "made Hypatia a powerful feminist symbol and a figure of affirmation for intellectual endeavour in the face of ignorant prejudice. Her intellectual accomplishments alone were quite sufficient to merit the preservation and respect of her name, but sadly, the manner of her death added to it an even greater emphasis."
References

4. https://faithljustice.wordpress.com/2012/03/15/hypatia-sources/