Work Of Euclid For Geometry Essay, Research Paper

The Work of Euclid for Geometry

Euclid is one of the most influential and best read mathematicians of all time. His prize work, Elements, was the textbook of elementary geometry and logic up to the early twentieth century. For his work in the field, he is known as the father of geometry and is considered one of the great Greek mathematicians.

Very little is known about the life of Euclid. Both the dates and places of his birth and death are unknown. The best estimation is that he was born around 325 BC and died around 265 BC. It is believed that he was educated at Plato’s academy in Athens and stayed there until he was invited by Ptolemy I to teach at his newly founded university in Alexandria. There, Euclid founded the school of mathematics and remained there for the rest of his life.

As a teacher, he was probably one of the mentors to Archimedes. Personally, all accounts of Euclid describe him as a kind, fair, patient man who quickly helped and praised the works of others. However, this did not stop him from engaging in sarcasm. One story relates that one of his students complained that he had no use for any of the mathematics he was learning. Euclid quickly called to his slave to give the boy a coin because “he must make gain out of what he learns.”

Another story relates that Ptolemy asked the mathematician if there was some easier way to learn geometry than by learning all the theorems. Euclid replied, “There is no royal road to geometry” and sent the king to study.

Euclid’s fame comes from his writings, especially his masterpiece Elements. This 13-volume work is a compilation of Greek mathematics and geometry. It is unknown how much if any of the work included in Elements is Euclid’s original work; many of the theorems found can be traced to previous thinkers including Euxodus, Thales, Hippocrates and Pythagoras. However, the format of Elements belongs to him alone.

Each volume lists a number of definitions and postulates followed by theorems, which are followed by proofs using those definitions and postulates. Every statement was proven, no matter how obvious.

Euclid chose his postulates carefully, picking only the most basic and self-evident propositions as the basis of his work. Previously, rival schools each had a different set of postulates, some of which were very questionable. This format helped standardize Greek mathematics.

As for the subject matter, it covered the extent of ancient thought. The subjects include the transitive property, the Pythagorean theorem, algebraic identities, circles, tangents, plane geometry, the theory of proportions, prime numbers, perfect numbers, properties of positive integers, irrational numbers, 3-dimensional figures, inscribed and circumscribed figures, LCD, GCM, and the construction of regular solids.

Especially noteworthy subjects include the method of exhaustion, which would be used by Archimedes in the invention of integral calculus, and the proof that the set of all prime numbers is infinite.

Elements was translated into both Latin and Arabic and is the earliest similar work to survive, basically because it is far superior to anything previous. The first printed copy came out in 1482 and was the geometry textbook and logic primer by the 1700s. During this period Euclid was highly respected as a mathematician and Elements was considered one of the greatest mathematical works of all time.

The publication was used in schools up to 1903. Euclid also wrote many other works including Data, On Division, Phaenomena, Optics and the lost books Conics and Porisms.

Today, Euclid has lost much of the godlike status he once held. In his time, many of his peers attacked him for being too thorough and including self-evident proofs, such as one side of a triangle cannot be longer than the sum of the other two sides. Today, however, most mathematicians attack Euclid for the exact opposite reason that he was not thorough enough. In Elements, there are missing areas that eventually needed to be filled in by following mathematicians.

In addition, several errors and questionable ideas have been found. The most glaring one deals with his fifth postulate, also known as the parallel postulate. The proposition states that for a straight line and a point not on the line, there is exactly one line that passes through the point parallel to the original line. Euclid was unable to prove this statement but he needed it for his proofs, so he assumed it to be true.

Future mathematicians could not accept such a statement was not provable and spent centuries looking for an answer. Only with the onset of non-Euclidean geometry, that replaces the statement with postulates that assume different numbers of parallel lines, has the statement been generally accepted as necessary.

Despite these problems, though, Euclid holds the distinction of being one of the first persons to attempt to standardize mathematics and set it upon a foundation of proofs. His work acted as a springboard for future generations.