# Nicomedes Encyclopedia Article

## Nicomedes

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# Nicomedes

**c. 280-c. 210 B.C.**

**Greek Mathematician**

Nicomedes is remembered for developing the conchoid, a special curve he used for solving two of the famous problems that perplexed ancient Greek mathematicians, trisection of the angle and duplication of the cube. Also notable was his lemma, a minor theorem he discovered in the course of working on the latter problem.

Based on the fact that he knew about (and criticized the methodology of) the measurement of Earth's circumference as performed by Eratosthenes (c. 285-c. 205 B.C.), it is possible to date Nicomedes with some accuracy, but nothing else is known of his life, except that he may have come from the Greek city-state of Pergamum in Asia Minor. *On Conchoid Lines,* his most notable—and perhaps only—written work, has been lost.

Portions of it that have survived in the writings of others, however, provide historians with knowledge of the conchoid and lemma. The first of these looks rather like what a modern person would describe as a very flat Bell curve, but to the Greeks it appeared like a sea creature; hence the derivation of the name from *konche,* or mussel shell. Below this curve was a line, and beneath that a point parallel to the apogee of the curve. By determining the length of a segment from the apogee to the lower point, it was possible to find segments of equal length—both of which also intersected the curve—on either side of that one. This in turn yielded a trisected angle, providing a solution of sorts to one of the great problems of antiquity.

The conchoid could also, Nicomedes maintained, be used for finding mean proportionals and thus for solving the Delian problem of doubling the cube. In working out the latter problem, Nicomedes developed his lemma. Using the traditional instruments of straightedge and compass, he began with two lines that bisect and form part of numerous triangles. Eventually this process yielded the lemma, which identified two particular sides of the triangles as equal, and this in turn gave him a way of finding mean proportionals. Centuries later, François Viète (1540-1603) would use the lemma for solving equations of the third and fourth degrees.