Some etymology.[1]

Many names and words used today may be traced back to the Arabian period. Thus anyone interested in observational astronomy probably is aware that a large number of star names, particularly those of the fainter stars, are Arabic. Well known examples are Aldebaran, Vega, and Rigel, among the brighter stars, and Algol, Alcor, and Mizar, among the fainter ones. Many of the star names were originally expressions locating the stars in the constellations. These descriptive expressions when transcribed from Ptolemy's catalogue into the Arabic, later degenerated into single words. Thus we have Betelgeuse (armpit of the Central One), Fomalhaut (mouth of the Fish), Deneb (tail of the Bird), Rigel (leg of the Giant), and so forth.

The origin of our word *algebra* from the title of al-Khowârizmî's treatise on the subject, *Hisâb al-jabr w'al-muqâ-balah*, is very interesting. This title has been literally translated as "science of the reunion and the opposition", or more freely as "science of transposition and cancellation"[2]. The text, which is extant, became known in Europe through Latin translations, and made the word *al-jabr*, or *algebra*, synonymous with the science of equations. Since the middle of the nineteenth century, *algebra* has come, of course, to mean a great deal more.

The Arabic word *al-jabr*, used in a nonmathematical sense, found its way into Europe through the Moors of Spain. There an *algebrista* was a bonesetter (reuniter of broken bones), and it was usual for a barber of the times to call himself an *algebrista*, for bonesetting and bloodletting were sidelines of the medieval barber.

Al-Khowârizmî's book on the use of the Hindu numerals also introduced a word into the vocabulary of mathematics. This book is not extant in the original,

but in 1857 a Latin translation was found which begins "Spoken has Algoritmi, …". Here the name *al-Khowârizmî* had become *Algoritmi*, from which, in turn, was derived our present word "algorithm", meaning the art of calculating in a particular way.

The meanings of the present names of the trigonometric functions, with the exception of *sine*, are clear from their geometrical interpretations when the angle is placed at the center of a circle of unit radius. Thus, in Figure 1, if the radius of the circle is one unit, the measures of $\tan\partial$ and $\sec\partial$ are given by the lengths of the *tangent* segment CD and the *secant* segment OD. And, of course, cotangent merely means complement's tangent, and so on. The functions tangent, cotangent, secant and cosecant have been known by various other names, these present ones appearing as late as the end of the sixteenth century.

The origin of the word *sine* is curious. Aryabhata called it *ardha-jya* ("half-chord") and also *jya-ardha* ("chord-half"), and then abbreviated the term by simply using *jya* ("chord"). From *jya* the Arabs phonetically derived *jîba*, which, following Arabian practice of omitting vowels, was written as *jb*. Now *jîba*, aside from its technical significance, is a meaningless word in Arabic. Later writers, coming across *jb* as an abbreviation for the meaningless *jîba*, substituted *jaib* instead, which contains the same letters and is a good Arabic word meaning "cove" or "bay". Still later, Gherardo of Cremona (ca. 1150), when he made his translations from the Arabic, replaced the Arabian *jaib* by its Latin equivalent, *sinus*, whence came our present word *sine*.
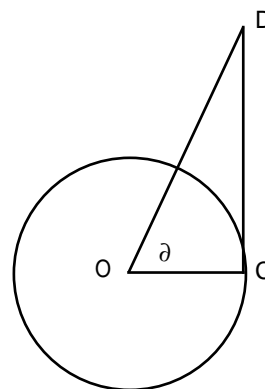

Figure 1

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1   See Howard Eves, "An introduction to the history of mathematics", The Saunders Series, Fifth Edition (1983): 176-177.

2   For a deeper analysis, see Solomon Gandz, "The origin of the term 'algebra'", American Mathematical Monthly 33 (1926): 437-440.