



## Are Circular Functions Trigonometric or Real?

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### Abstract:

Many students see trigonometric functions and real functions as two disjoint categories because trigonometric functions are introduced before real functions. Therefore, if we want students to grasp  $\sin(x)$  as a real function, we should introduce it as such. We shall describe a teaching unit which was developed at the Weizmann Institute of Science, with the aim of improving the teaching of mathematics by creating a network of relations between concepts and the procedures that lead to them. Archimedes' method for computing the circumference of the circle is used to compute the chord of any arc in a unit circle, or compute the arc corresponding to any given chord of a unit circle. Computer Algebra Systems can carry out the needed computations in a way that the average student can follow. We start by loading a utility file IN\_POLY (created in Derive) that animates Archimedes' method of computing the circumference of a unit circle adapted to the general case of an arc. The students are led to define ARCSINE( $x, n$ ) using the ITERATE command. Then we link it to the standard ASIN( $x$ ). A similar approach leads to the definition of SINE( $x, n$ ). Thus we introduce  $\sin(x)$  as a circular function, which makes it a real function from the beginning.

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