The first part of this talk will cover the vision for www.specialfunctions.com, which is the third in a series of encyclopedic web sites sponsored and maintained by Wolfram Research. (The other two sites are www.mathworld.com and www.polytopes.com.) Our goal is to collect all available material about special functions on this site. This talk will outline the advantages of a web site (which will longterm use MathML) with a sophisticated search engine over a printed handbook. Building this site will start with the over 250 built-in functions of Mathematica and then we will cover additional special functions. (For these additional special functions we will also maintain a Mathematica code repository). The structure of the site and the structure of each function’s page will be discussed in detail. Each function’s page will contain many mathematical formulas, historical information, and a variety of graphics, including Riemann surfaces for multivalued functions. The importance of contributions to this web site will then become obvious and a submission procedure will be discussed.

The second part of the talk will show how the algebraic capabilities of Mathematica (with functions such as GroebnerBasis, PolynomialReduce) can be used to derive new identities for special functions, for example, polynomial addition formulas for Weierstrass elliptic functions, differential equations for modular functions. A short overview will be given on visualization techniques for Riemann surfaces. In addition, some “experimental mathematics” techniques will be sketched that allow to find conjectured and new identities. Finally, some examples will be given that show the importance of algorithms for a variety of series expansions like Riemann Siegel and for zeros of Bessel functions.