About the Cover

Very special functions

The cover was suggested by this issue's article by Daniel Lozier and others on the National Institute of Standards and Technology's (NIST) mathematical functions project. It amounts to an assembly of screenshots taken from the associated online Digital Library of Mathematical Functions.

Graphics are a distinctive part of this project. When we asked Bonita Saunders of the NIST Mathematical Software Group to say something about its production, she replied:

> We first thought the development of graphics for the DLMF would be fairly straightforward: Create the graphs using a commercial or free package and export the data to a format that could be viewed on the Web. While this worked well for 2D graphs of function curves, it did not work for 3D graphs. A considerable amount of user input was needed to plot accurate graphs of function surfaces in most packages. This has improved considerably in recent years, but in many cases it is still difficult to export the data to suitable formats, especially if the goal is interactive viewing on the Web.
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> To eliminate or lessen the severity of our plotting problems, we designed custom-made computational meshes to properly clip the surfaces and capture key function features such as zeros, poles, branch cuts, and other singularities. To ensure the accuracy of all function data, we computed the functions using at least two different methods. We designed our own translators to export the 3D data to file formats such as VRML (Virtual Reality Modeling Language) and X3D, which allow a user to manipulate 3D scenes and objects on the Web with a free downloadable viewer. We wrote code to supplement the standard rotate, zoom, and pan capabilities with user options—to change the color map, vary the scaling of the surface, create density plots, change the look of the axes, and interactively move a cutting plane through the surface in each coordinate direction.
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> We expect to continually enhance the graphics on the website. In particular, sometime in the future we hope to offer an option that allows users to view the interactive graphics inside a webpage without the need of a special viewer.

Our thanks also to Brian Antonishek, also of NIST, for much help in assembling the cover.

—Bill Casselman
Graphics Editor
(notices-covers@ams.org)