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David A. Brown* (dabrown@ithaca.edu), Department of Mathematics, Ithaca College, Ithaca, NY 14850. *Rolling Wheels: Explore Curve Sketching via GeoGebra and Mathematica.*

Cycloids, hypocycloids, epitrochoids, and more generally, curve sketching via truncated Fourier series, provide students the opportunity to explore the interplay among geometry, functions, and number theory. This lesson (used in multivariable calculus and a course in mathematical experimentation) asks the students to investigate these topics by first considering rolling wheels and how points on the wheels can trace curves. GeoGebra and Mathematica are used to simulate these evolving curves and we provide lessons using both software packages. As students move on to explore a wheel rolling on a wheel rolling on yet another wheel, they develop functions which are truncated Fourier series. The lesson asks students to explore (via GeoGebra and/or Mathematica) the parameters involved in these functions, leading them to realize that number theory is playing a role in the structure of the resulting curves. The lesson also allows students to experience their artistic side as they manipulate parameters. We even make a connection with automotive engineering. (Received September 03, 2011)