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A classroom note on trigonometric series in calculus.
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From the introduction: The following note presents reflections on how trigonometric series can be introduced in second semester calculus classes though Maple exercises. Summary: It has been beneficial to present the topic of Fourier series in freshman calculus classes and to precede a derivation of the process for generating such series expansions with Maple exercises in which students become convinced of the effectiveness of the series in approximating periodic functions. For first year students, having the Fourier coefficients of specific periodic functions and the corresponding Maple code for graphing the partial sums "dropped in their laps" with no prior motivation or justification can provide the inspiration to learn more about the subject. Developing this topic in parallel with Taylor series alerts students of the possibility of approximating functions by sums of trigonometric functions as well as power functions, and equips them with a tool that is essential for modeling periodic phenomena, which are ubiquitous in nature. It may also be pointed out that a non-periodic function may be approximated by a periodic one over an interval of finite length, in this manner allowing for the possibility of representing the original function by a trigonometric series over such an interval. In concluding coverage of the topic, instructors may invite students to view non-periodic functions as the limiting value of periodic ones whose period tends to infinity, and to speculate about how the notion of the representation by trigonometric sums could be extended to such functions. This would lead to a heuristic motivation for the Fourier transform, which many students will encounter in later courses.