The error in Fourier or Chebyshev interpolation is the product of a rapidly varying factor with a slowly varying modulation (called the envelope of the error). The author studies here the envelope which controls entirely the magnitude and spatial uniformity of the error. One interesting conclusion is that for simple functions, i.e., those with a single dominant pair of complex conjugate singularities or a single peak, the Fourier/Chebyshev error is anything but uniform. It is observed that the error envelope is sharply peaked about the point where \( f(x) \) is peaked or which is nearest the poles or branch points. It is also concluded that the error in solving a second-order differential equation using the pseudospectral method with \( N \) collocation points is typically smaller than the ‘residual’ function by a factor of \( O(N^2) \).

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References:


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