

Intro to Lecture 22

Nov. 23, 2016

Today we turn to a new topic, beginning with Fourier transforms of periodic functions, allowing their representation in terms of an infinite sequence of amplitudes for the harmonics. Examples of electronically interesting functions are square waves, sawtooth, and some others. Fourier transforms convert derivatives into algebraic equations, but make multiplication difficult. So they are very useful for linear differential equations. One interesting effect is called the Gibbs phenomenon, which shows that sharp cutoffs in the transform produce overshoots in time.

Then we will consider the limit as the period becomes infinite, which gives us Fourier transforms for functions defined on all of \mathbb{R} . These transforms are now continuous functions of the variables k or ω conjugate to x or t respectively.

Then we will glance at Laplace and Mellin transforms, and at more general integral transforms. But we are more interested in Green's functions, which we will discuss first for one-dimensional second order self-adjoint operators quite generally, and then for the Poisson and Helmholtz equations in \mathbb{R}^D for arbitrary dimension D .

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- Happy Thanksgiving. No class on Friday
 - Next week is normal except you have no homework due.
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