Fourier Transform Examples And Solutions

The Fourier transform is a mathematical operation that decomposes a function into its constituent frequencies. It is widely used in physics and engineering to analyze signals and systems. This page contains a collection of Fourier transform examples and solutions. These examples illustrate how to use the Fourier transform to solve various problems.

Example 1: Find the Fourier transform of the function f(t) = e^{-2t} u(t).

Solution: The Fourier transform of f(t) is given by

F(ω) = ∫_{-∞}^{∞} e^{-2t} u(t) e^{-jωt} dt

= ∫_{0}^{∞} e^{-2t} e^{-jωt} dt

= 1/(2+jω)

Example 2: Find the inverse Fourier transform of F(ω) = 1/(2+jω).

Solution: The inverse Fourier transform is given by

f(t) = ∫_{-∞}^{∞} 1/(2+jω) e^{jωt} dω

= e^{-2t} u(t)

Example 3: Find the Fourier transform of the periodic square wave function defined by f(t) = 1 for |t| < 1 and f(t) = 0 otherwise.

Solution: The Fourier transform of a periodic function is given by

F(ω) = 1/π ∑_{n=-∞}^{∞} δ(ω - n2π)

where δ is the Dirac delta function.

These examples demonstrate the power of the Fourier transform in analyzing signals and solving problems in various fields. The Fourier transform is a fundamental tool in signal processing, image analysis, and many other areas.

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