Assignment 4 – Report

Aditya Aggarwal

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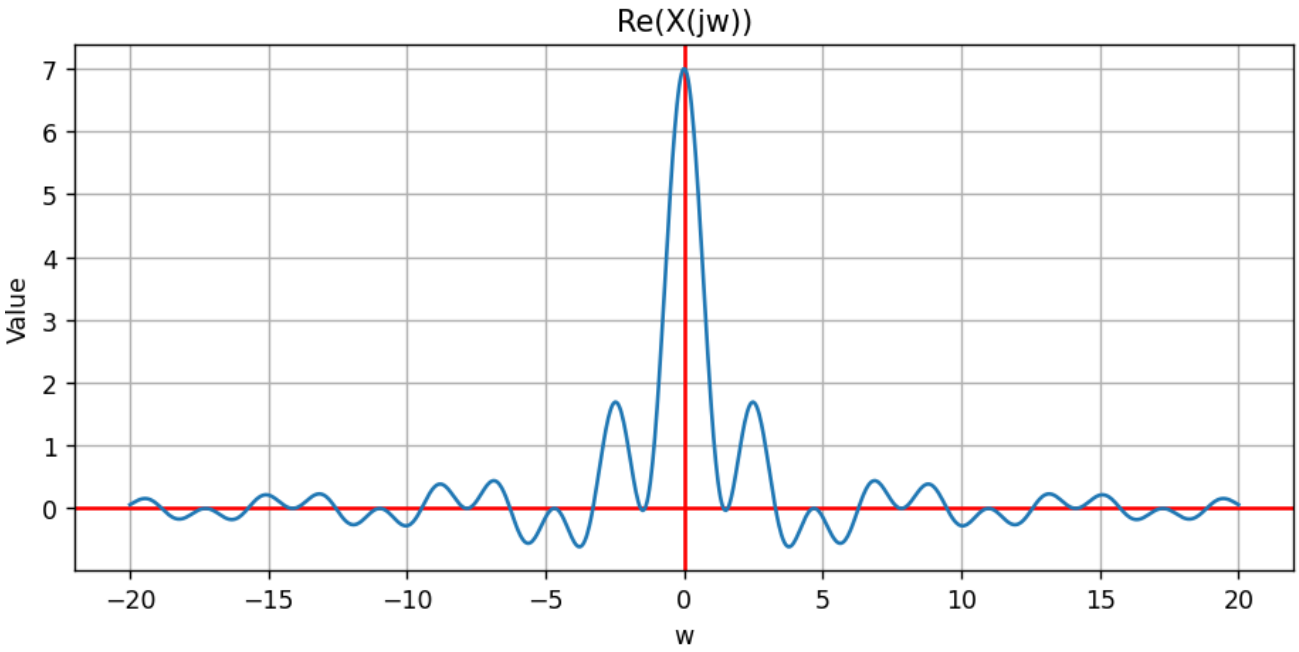
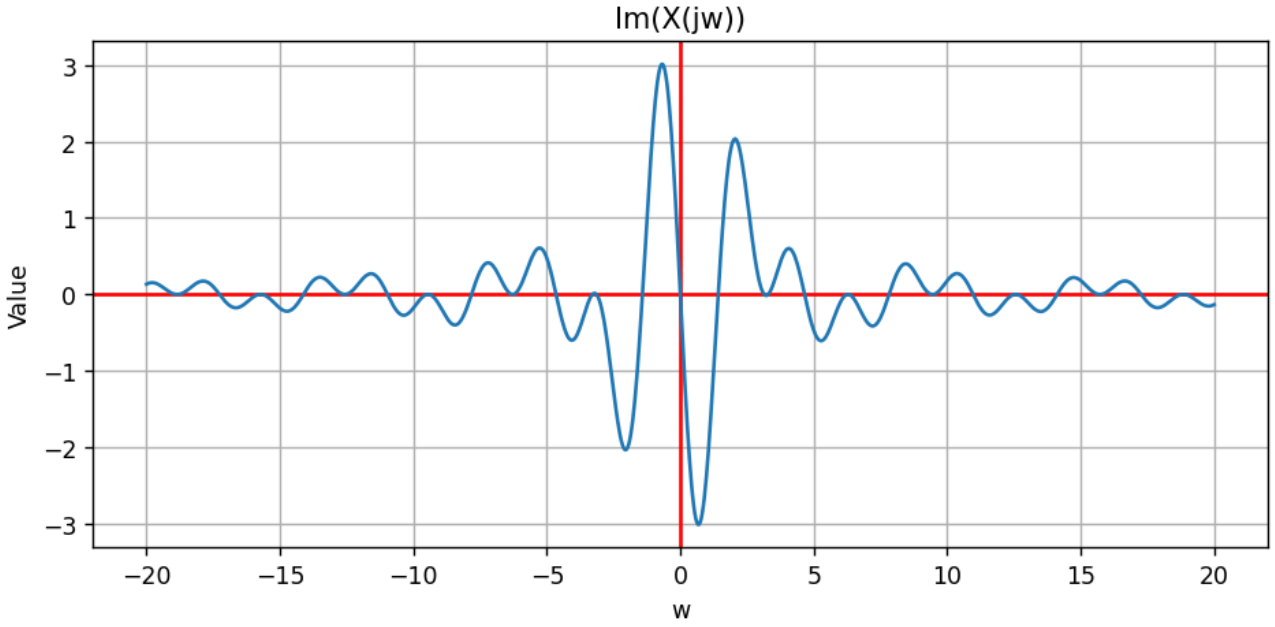
CSAI

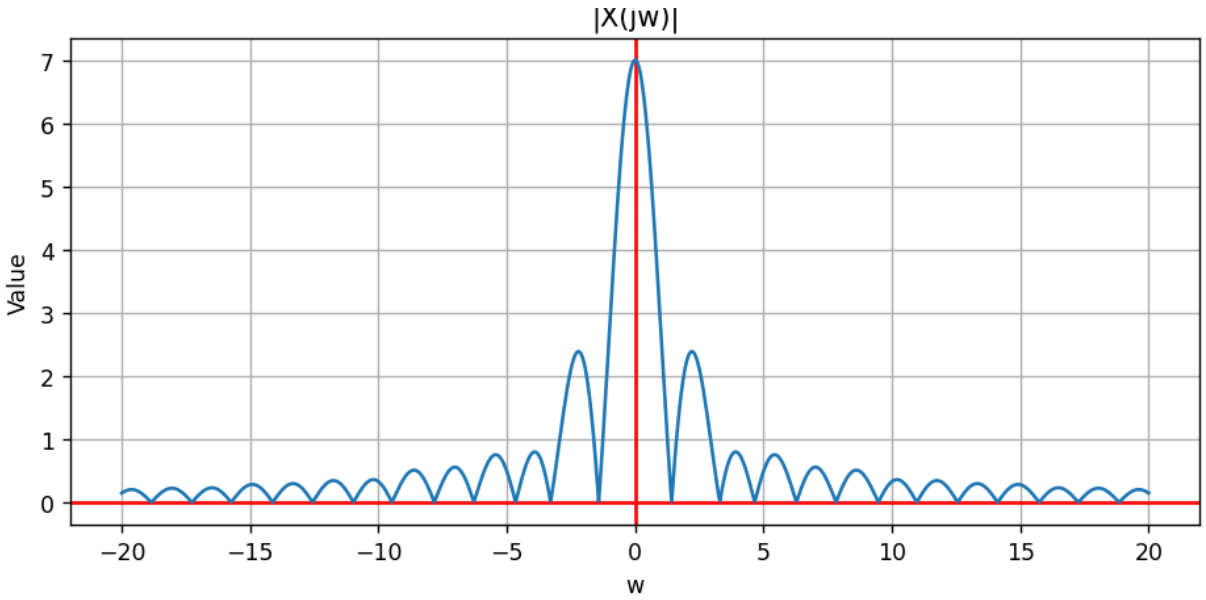
Answer 1

Plot for Fourier Transform in frequency domain:

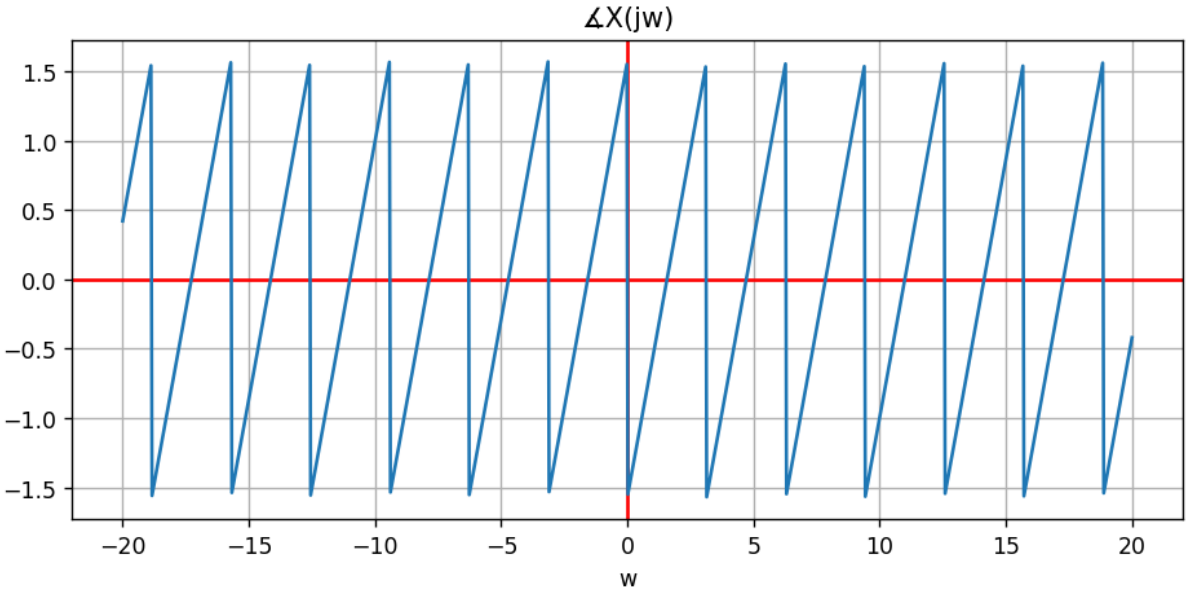




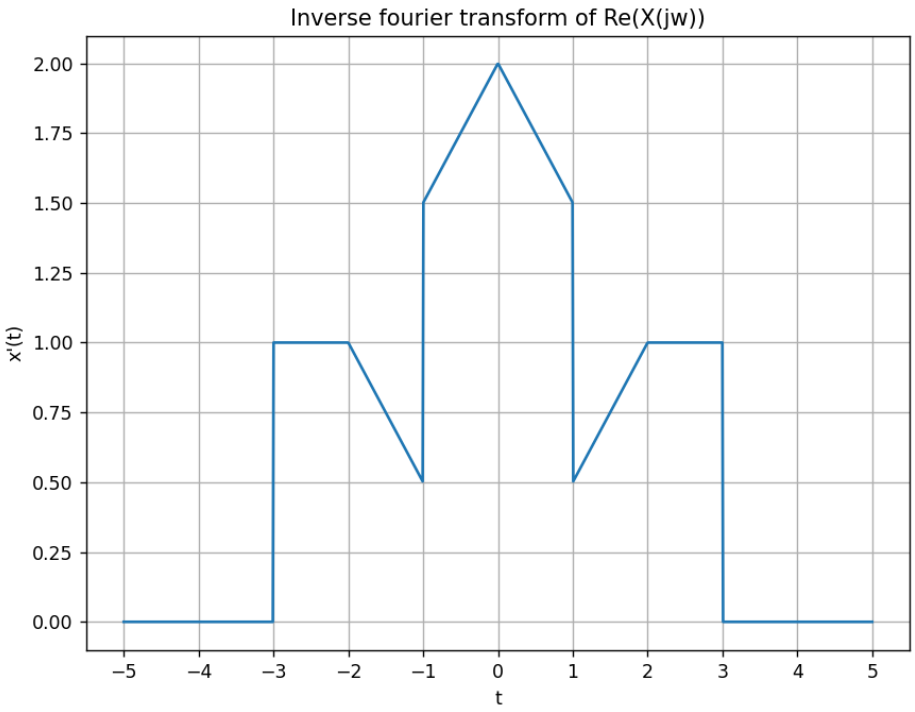
Magnitude spectrum:



Phase spectrum:



Inverse Fourier Transform of real part of X(jw)



Inference:

The real part peaks up to 7 at the origin and then decays on both ends. It is an even function.

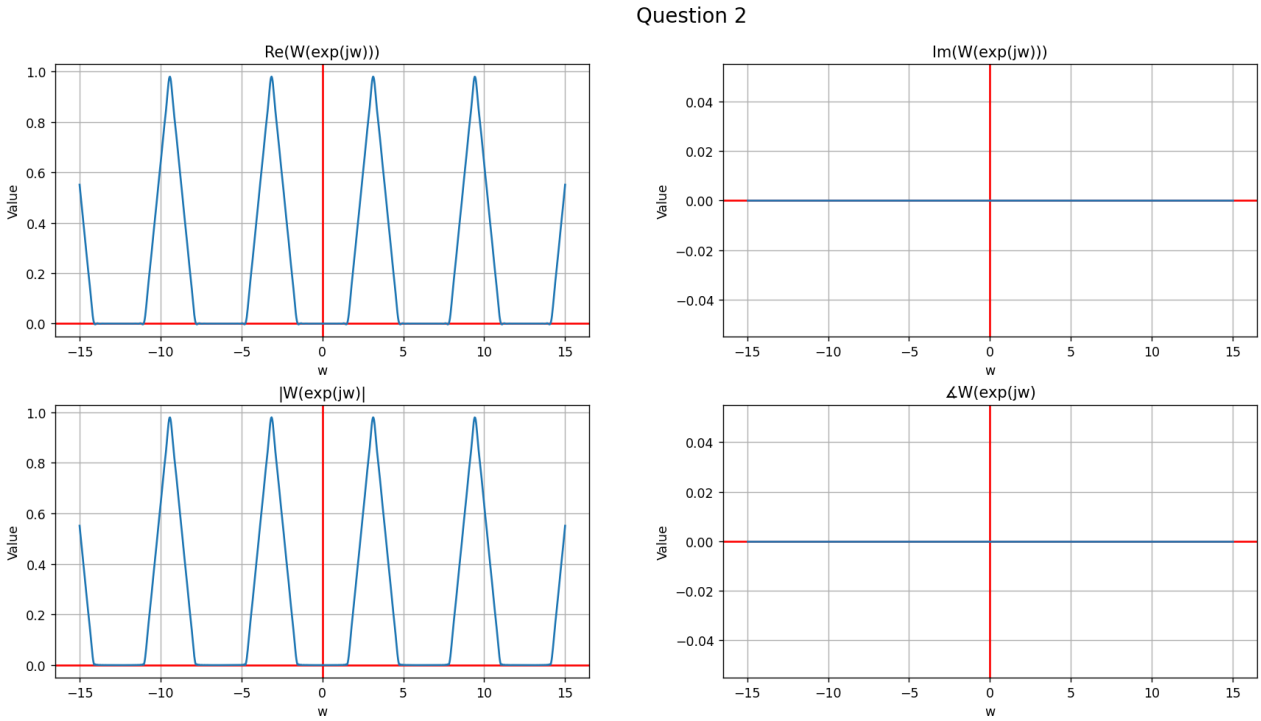
The imaginary part peaks up to ±π and decays on both sides of the axes. It is zero at the origin. It is an odd function.

As a result, the magnitude peaks up to 7 and decays on both ends. The resulting phase is periodically linear.

The inverse Fourier Transform of Re(X(jw)) peaks up to 2 at origin and is discontinuous in nature. It is an even function giving us the conclusion that Fourier Transform of an even part of the function is the real part of its Fourier transform and vice versa.

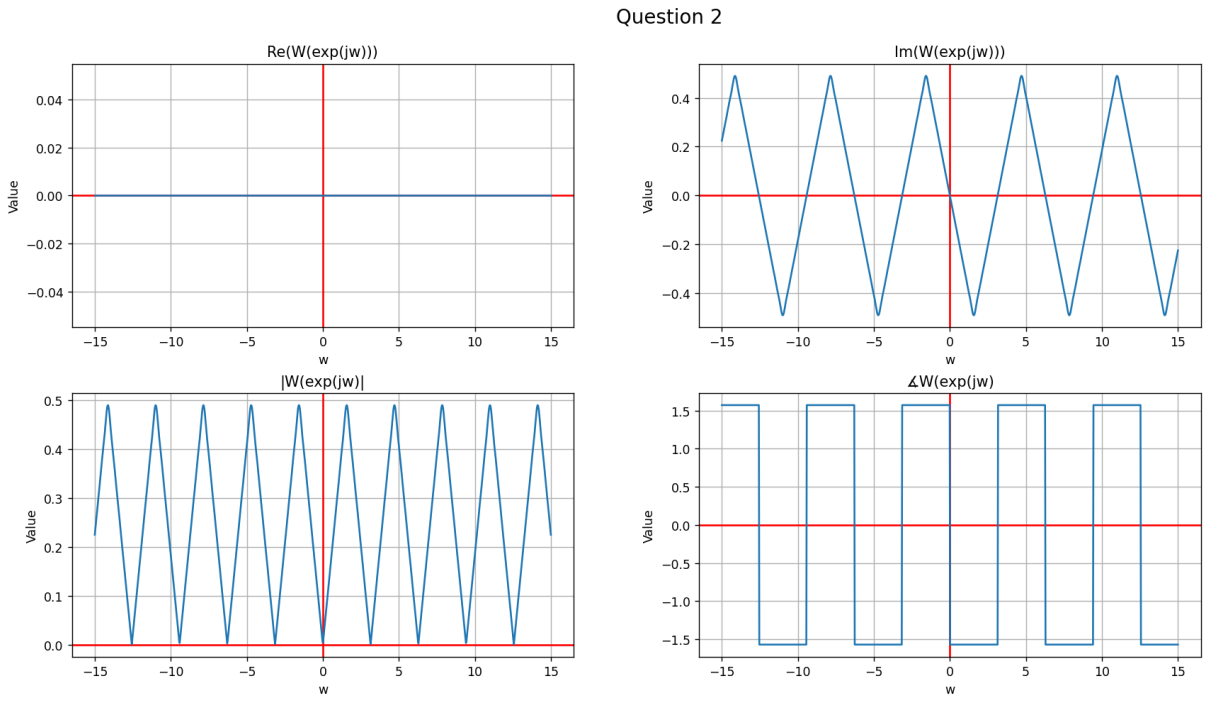
Answer 2

(a) p[n] = cos(πn)



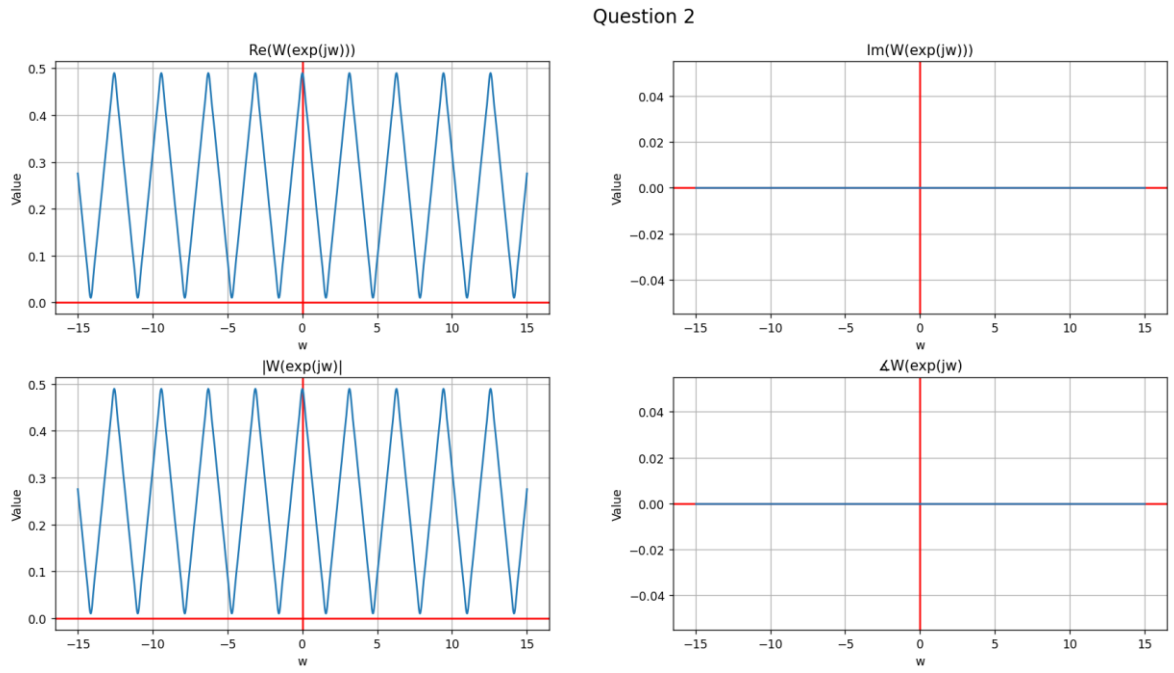
Inference: The Fourier Transform is a pure real function when the sinusoidal wave has angular frequency as an even multiple of π/2.

(b) p[n] = sin(πn/2)



Inference: The Fourier Transform is a pure imaginary function when the sinusoidal wave has angular frequency as an odd multiple of π/2.

(c) p[n] = ∑δ(n − 2k)



Inference: Given an impulse train, the Fourier Transform is purely real and periodically linear graph.

NOTE: Since summation from -infinity to infinity involves very large numbers that produce expressions approximately equal to zero, to save computational resources in python and for practicality, the summation was taken from -20 to 20 yielding roughly (and visually) the same results.