$\cos(\omega_0 n) \xleftrightarrow{FT} \sum_{l=-\infty}^{\infty} \pi(\delta(\omega-\omega_0-2\pi l)+\delta(\omega+\omega_0-2\pi l))$

$\cos(\pi n) \xleftrightarrow{FT} \pi\delta(\omega-\pi)+\pi\delta(\omega+\pi)$

$W(e^{j\omega}) = \frac{1}{2\pi} X(e^{j\omega}) * P(e^{j\omega})$

$= \frac{1}{2\pi}\left[X(e^{j\omega}) * [\pi(\delta(\omega-\pi)+\delta(\omega+\pi)]\right]$

$= \frac{1}{2} X(e^{j\omega}) * \delta(\omega-\pi) + \frac{1}{2} X(e^{j\omega}) * \delta(\omega+\pi)$

$= \frac{1}{2} X(e^{j(\omega-\pi)}) + \frac{1}{2} X(e^{j(\omega+\pi)})$

$\sin\frac{\pi n}{2} \xleftrightarrow{FT} \frac{\pi}{j}\left[\delta(\omega-\frac{\pi}{2})-\delta(\omega+\frac{\pi}{2})\right]$

$W(e^{j\omega}) = \frac{1}{2\pi} X(e^{j\omega}) * P(e^{j\omega})$

$= \frac{1}{2j} X(e^{j\omega}) * \delta(\omega-\frac{\pi}{2}) - \frac{1}{2j} X(e^{j\omega}) * \delta(\omega+\frac{\pi}{2})$

$= \frac{1}{2j} X(e^{j(\omega-\frac{\pi}{2})}) - \frac{1}{2j} X(e^{j(\omega+\frac{\pi}{2})})$

OBJ

Date / /
Pg No.

$x(t+1)$ is even so, ~~$\angle x(t+1) = 0$~~

$\angle F.T(x(t+1)) = 0$

Say $Y(j\omega)$

$\angle Y(j\omega) = 0$

$Y(j\omega) = e^{j\omega} X(j\omega)$

$X(j\omega) = e^{-j\omega} Y(j\omega)$

$\angle X(j\omega) = \angle e^{-j\omega} + \angle Y(j\omega)$

$\angle X(j\omega) = -\omega + 0$

$= -\omega$

F.T. of signal $\int_{-\infty}^{\infty} x(t)\, e^{-j\omega t}$

$= \int_{-1}^{0} 2\, e^{-j\omega t}\, dt + \int_{0}^{1} (-t+2)\, e^{-j\omega t}\, dt + \int_{1}^{2} t\, e^{-j\omega t}\, dt + \int 2 e^{-j\omega t}\, dt$

Will integrate this by online tools & put answer

$X(0) = 7$ $\quad$ $x(2) = 1-2j$ & so on

$|X(j0)| = 7$ $\quad$ $|X(2)| = \sqrt{3}$

$\text{Re}\{X(j\omega)\} \xleftrightarrow{FT} Ev(x(t)) = \frac{x(t) + x(-t)}{2}$

$$x(t) = \begin{cases} 2 & -3 \le t \le 2 \\ -t & -2 < t \le -1 \\ t+2 & -1 < t < 0 \\ 2 & 0 < t \le 1 \\ 0 & \text{otherwise} \end{cases}$$

$F.T.\{Re(x(t))\}$ $\quad$ $Ev(x(t))$

$$\begin{cases} 1 & -3 \le t \le 3 \\ -\frac{t}{2} & -2 \le t \le 1 \\ \frac{t+4}{2} & 0 \le t \le 1 \\ \frac{t}{2} & 1 \le t < 2 \\ 1 & 2 \le t < 3 \\ 0 & \text{otherwise} \end{cases}$$

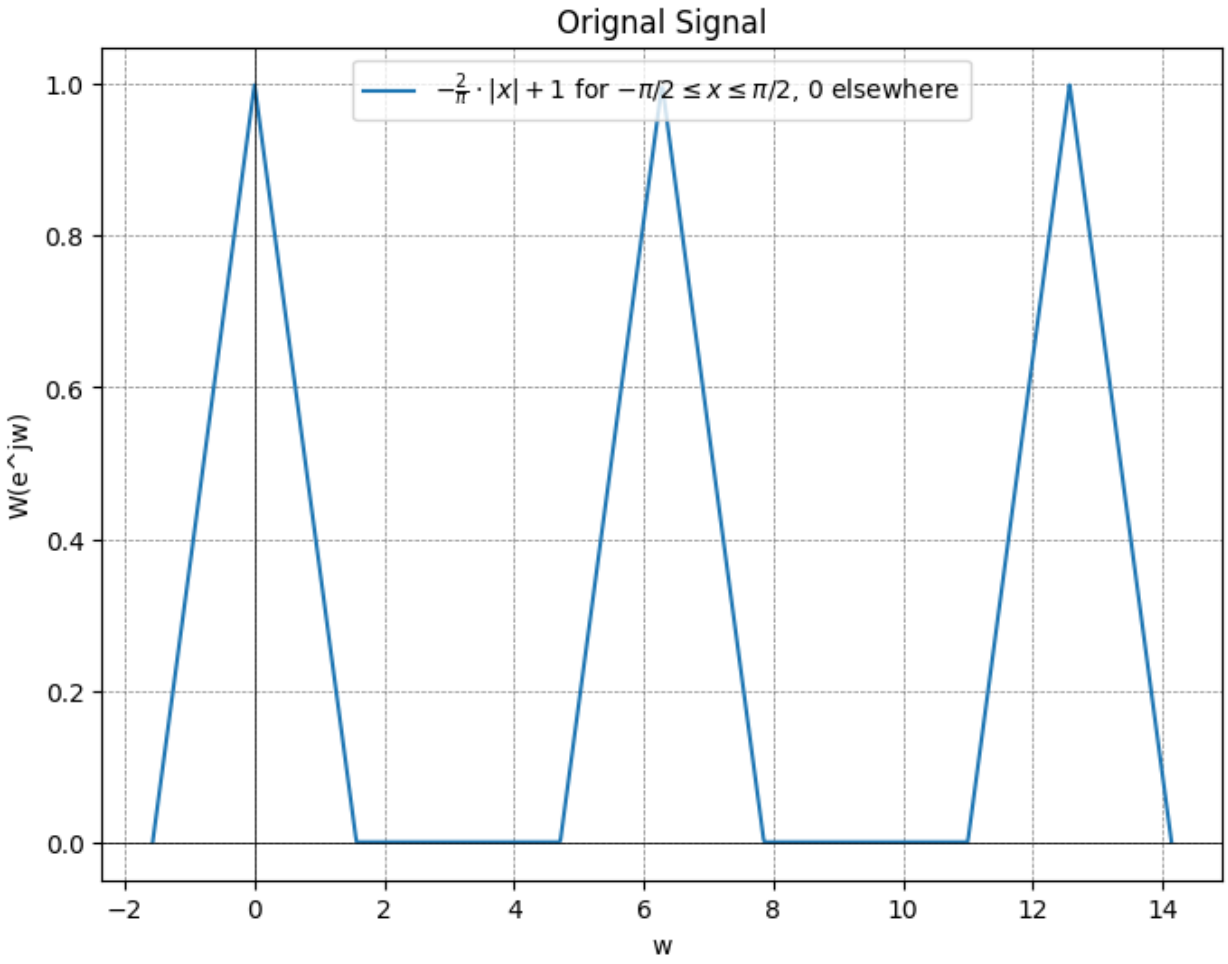
$$\sum_{k=-\infty}^{\infty} \delta[n-kN] \xleftrightarrow{FT} \frac{2\pi}{N} \sum_{k=-\infty}^{\infty} \delta\left(\omega - \frac{2\pi k}{N}\right)$$

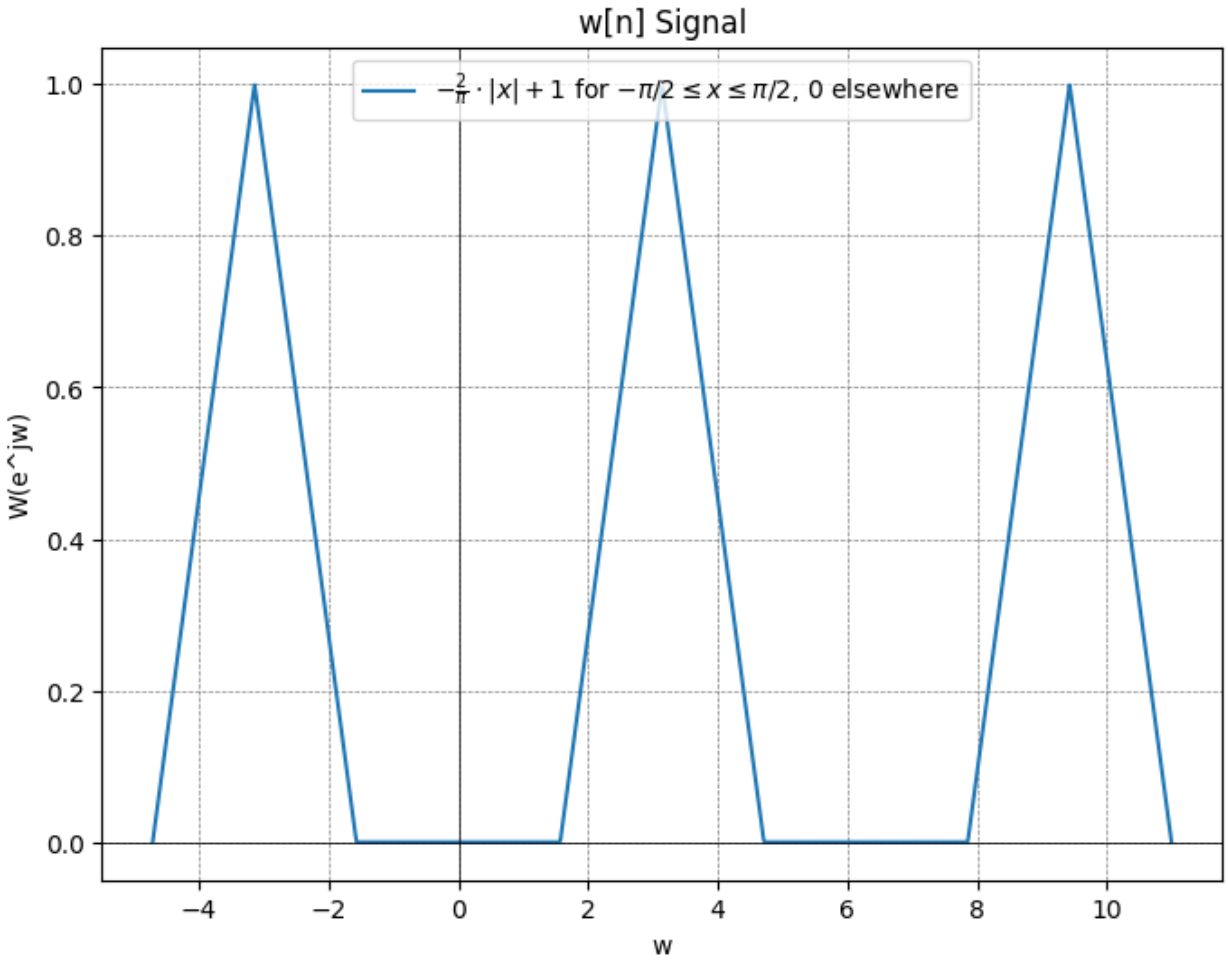
$$\sum_{k=-\infty}^{\infty} \delta[n-2\pi n] \xleftrightarrow{FT} \pi \sum_{k=-\infty}^{\infty} \delta[\omega - \pi k]$$

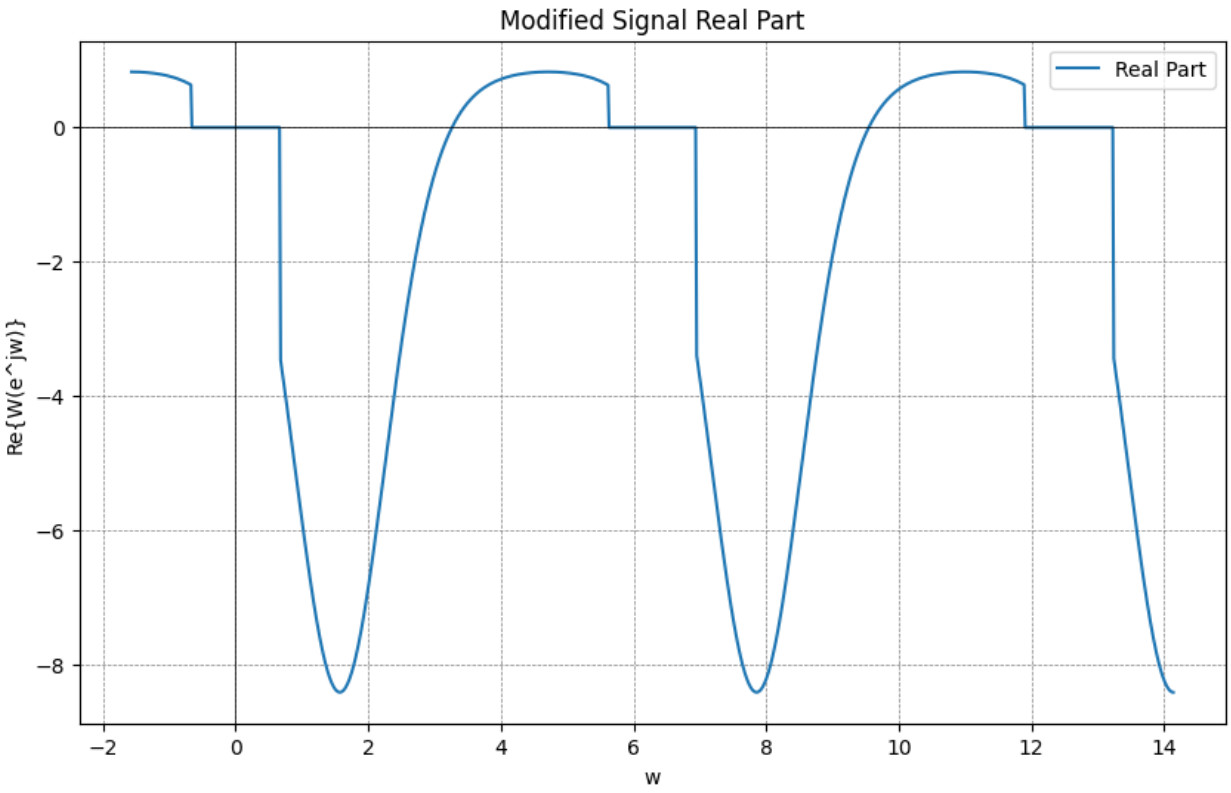
$$FT\{x_w[n]\} = \frac{1}{2\pi} X(e^{j\omega}) * P(e^{j\omega})$$

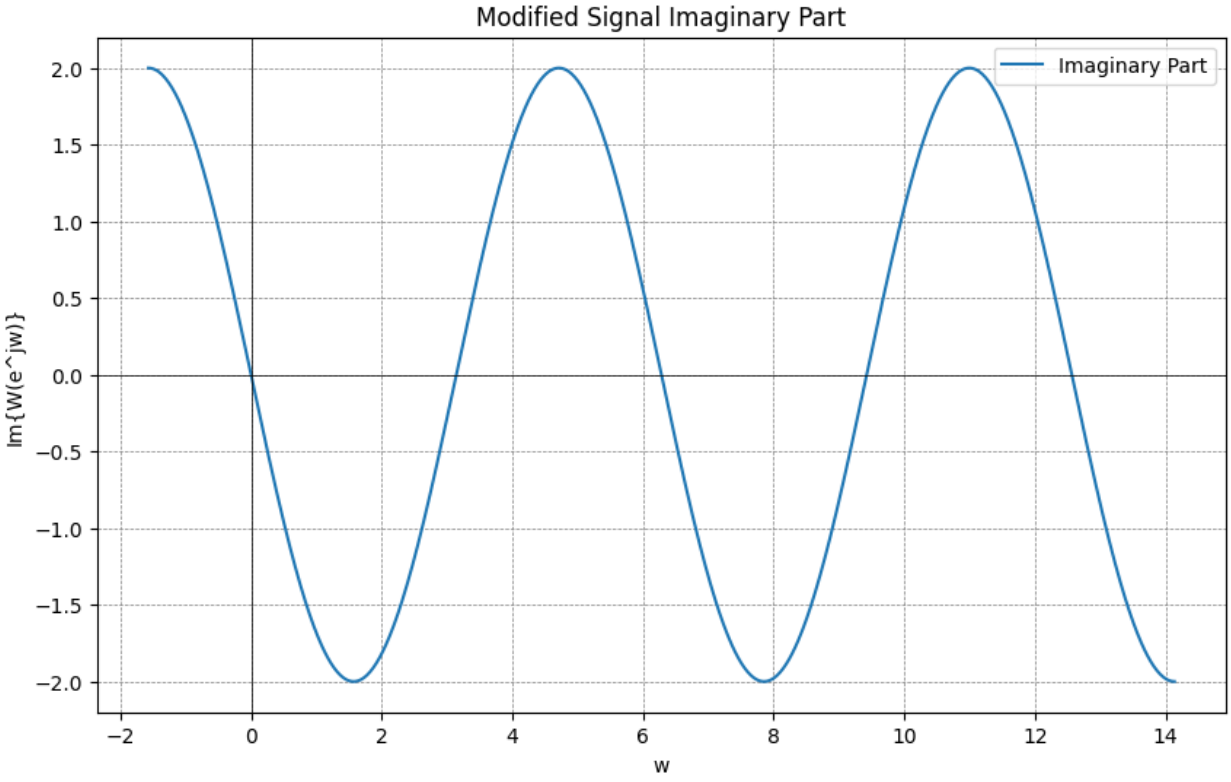
$$= \frac{1}{2\pi} [X(e^{j\omega})] * \left[\pi \sum_{k=-\infty}^{\infty} \delta(\omega - \pi k)\right]$$

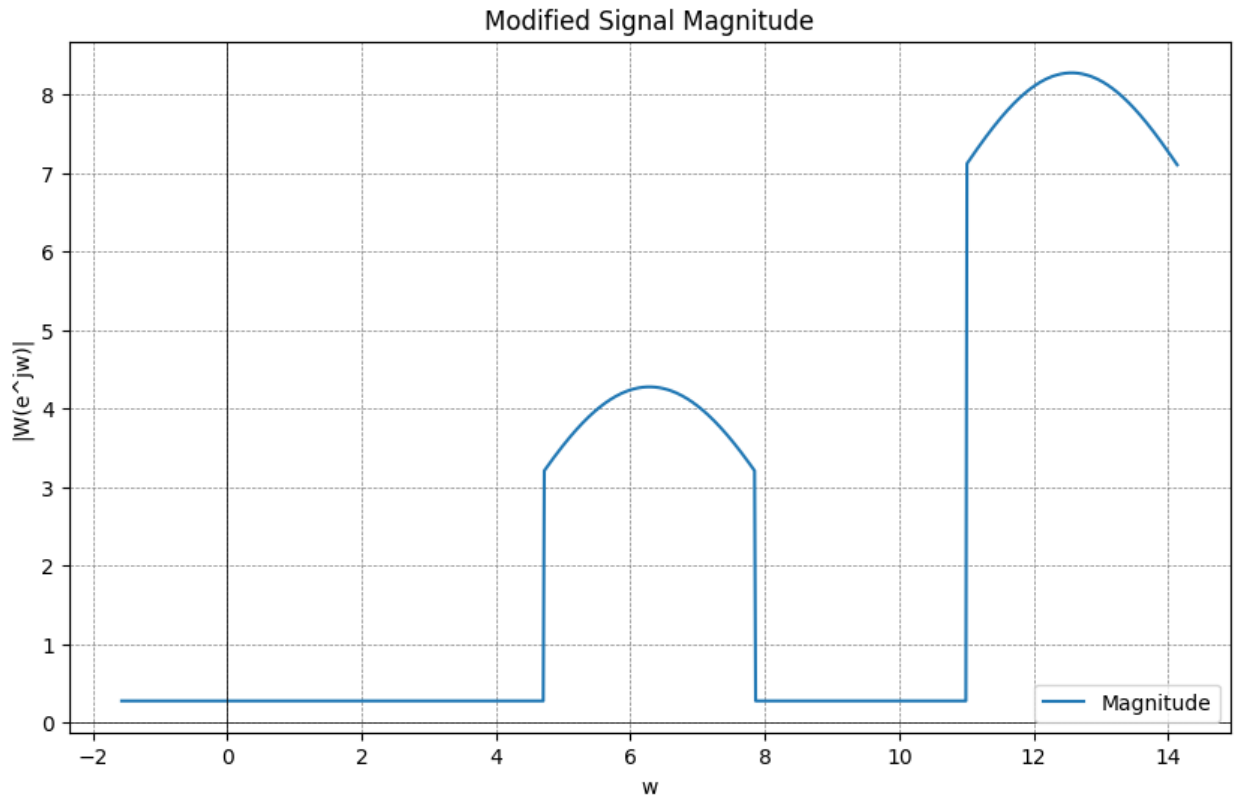
$$= \frac{1}{2} \sum_{k=-\infty}^{\infty} X(e^{j(\omega - \pi k)})$$

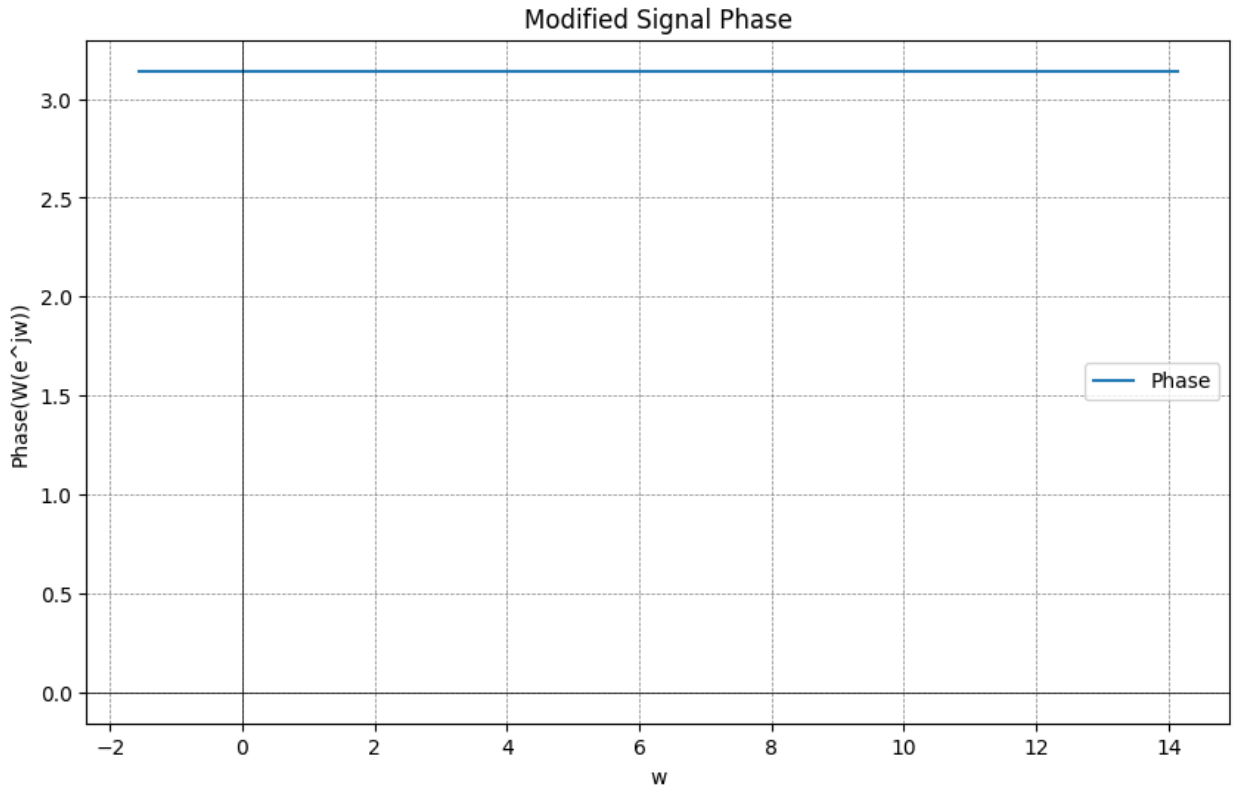

Orignal Signal
$-\frac{2}{\pi} \cdot |x| + 1$ for $-\pi/2 \leq x \leq \pi/2$, 0 elsewhere
1.0
0.8
0.6
0.4
0.2
0.0
W(e^jw)
−2
0
2
4
6
8
10
12
14
w

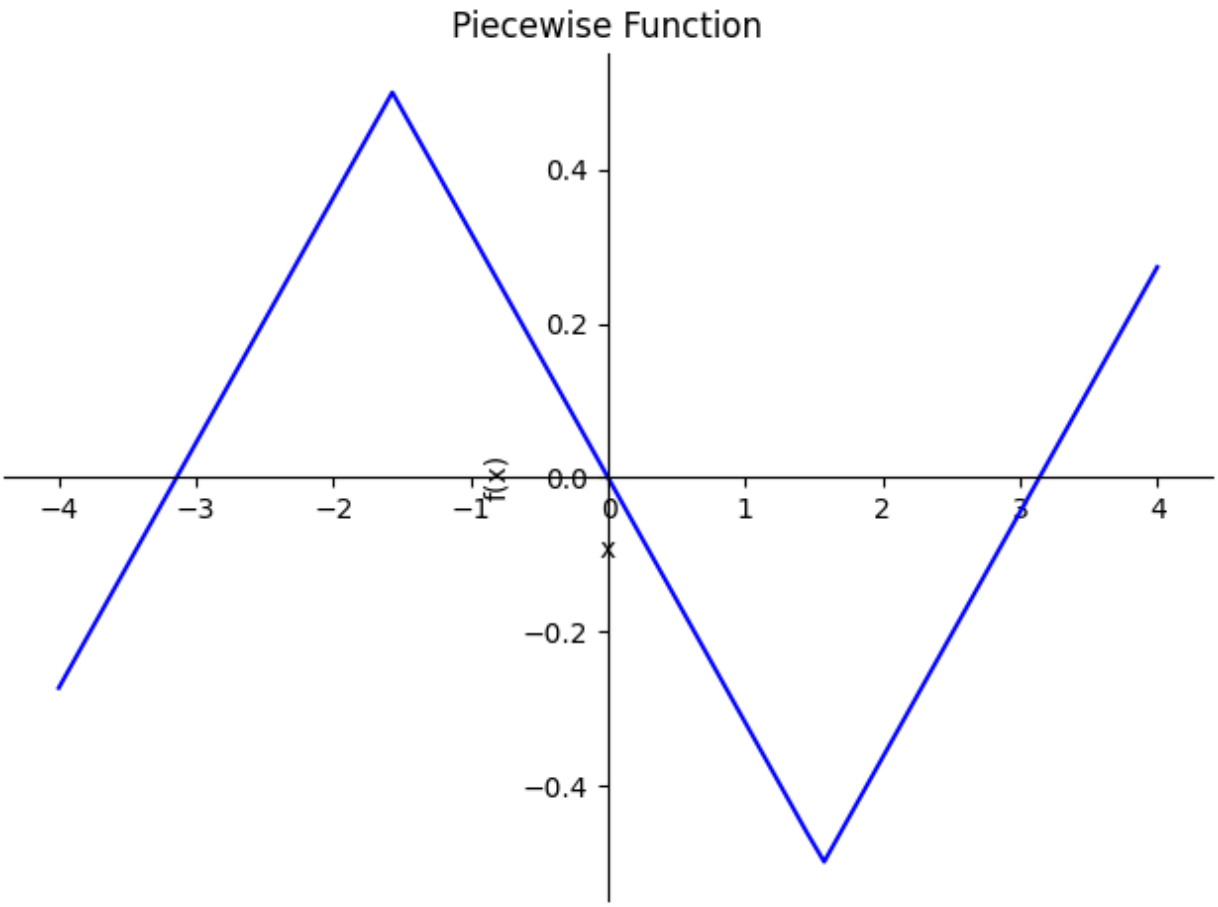

w[n] Signal
$-\frac{2}{\pi} \cdot |x| + 1$ for $-\pi/2 \leq x \leq \pi/2$, 0 elsewhere
1.0
0.8
0.6
0.4
0.2
0.0
W(e^jw)
−4
−2
0
2
4
6
8
10
w

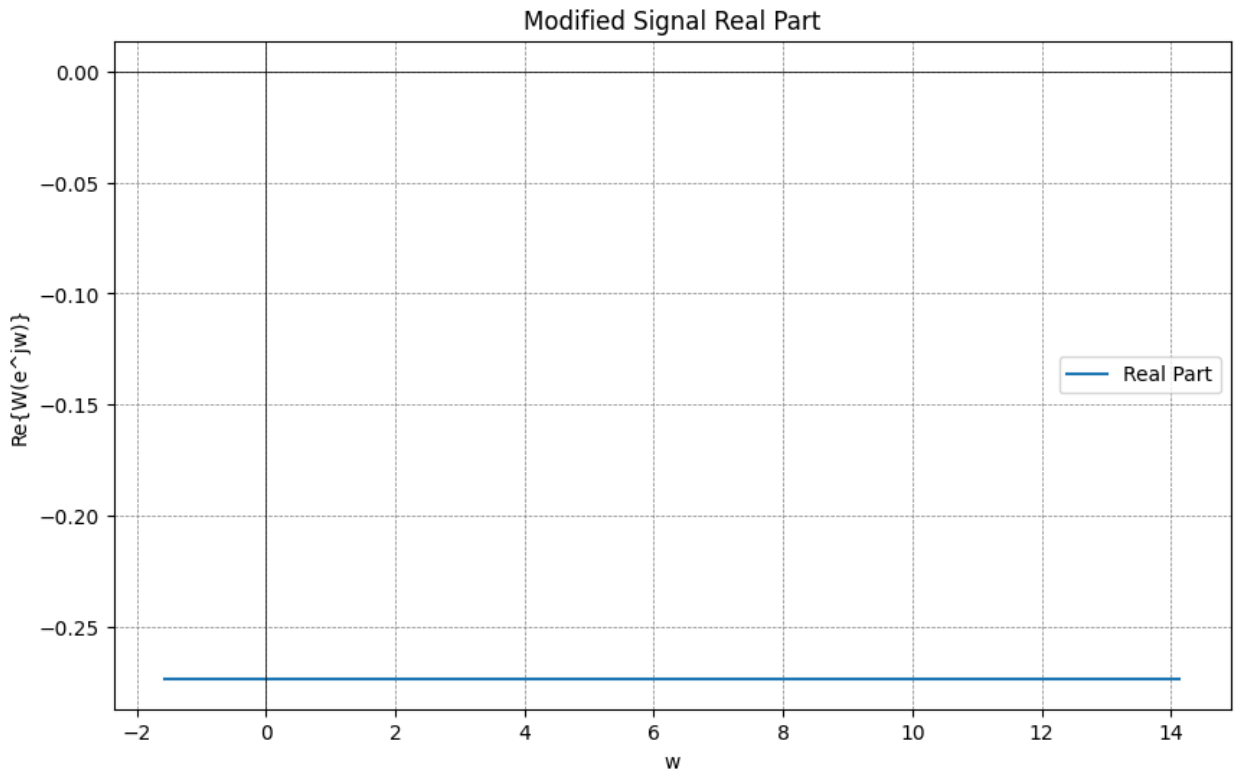

Modified Signal Real Part
Real Part
Re{W(e^jw)}
w
0
−2
−4
−6
−8
−2
0
2
4
6
8
10
12
14

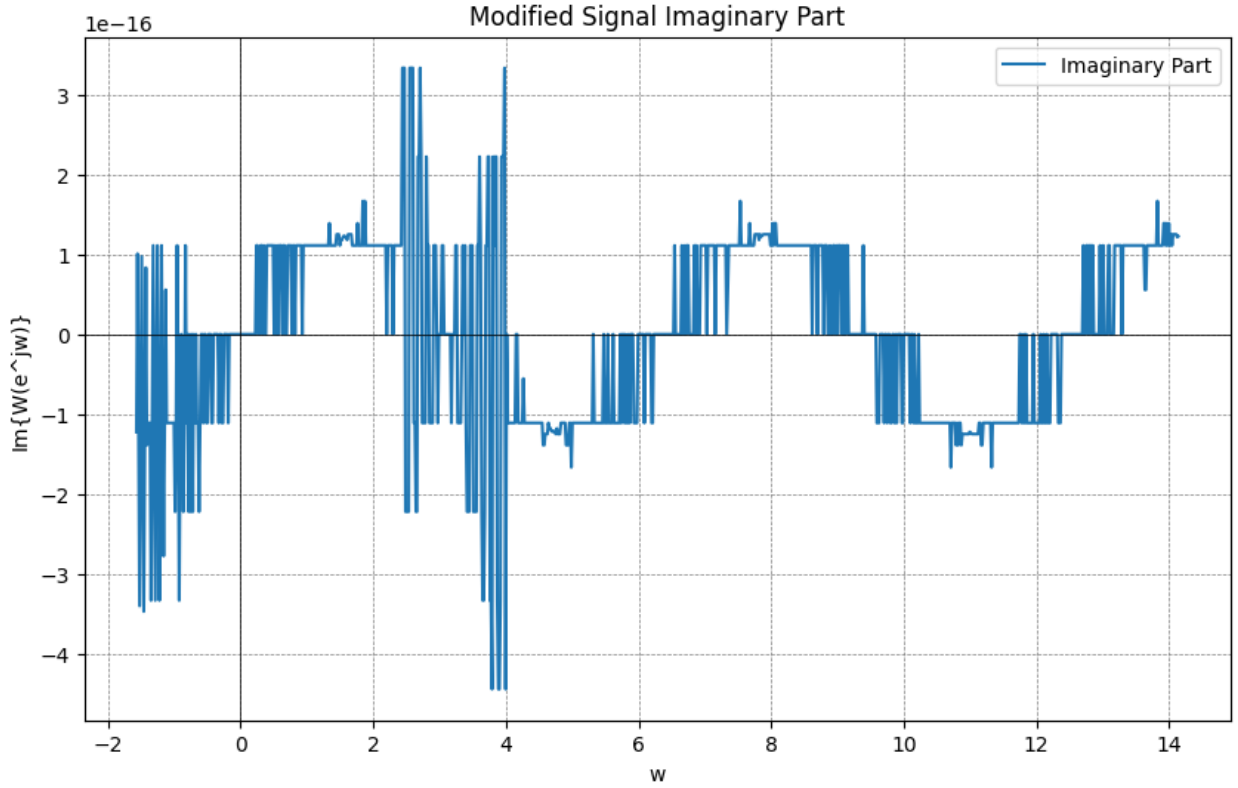

Modified Signal Imaginary Part
Imaginary Part
Im{W(e^jw)}
w
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
−2
0
2
4
6
8
10
12
14

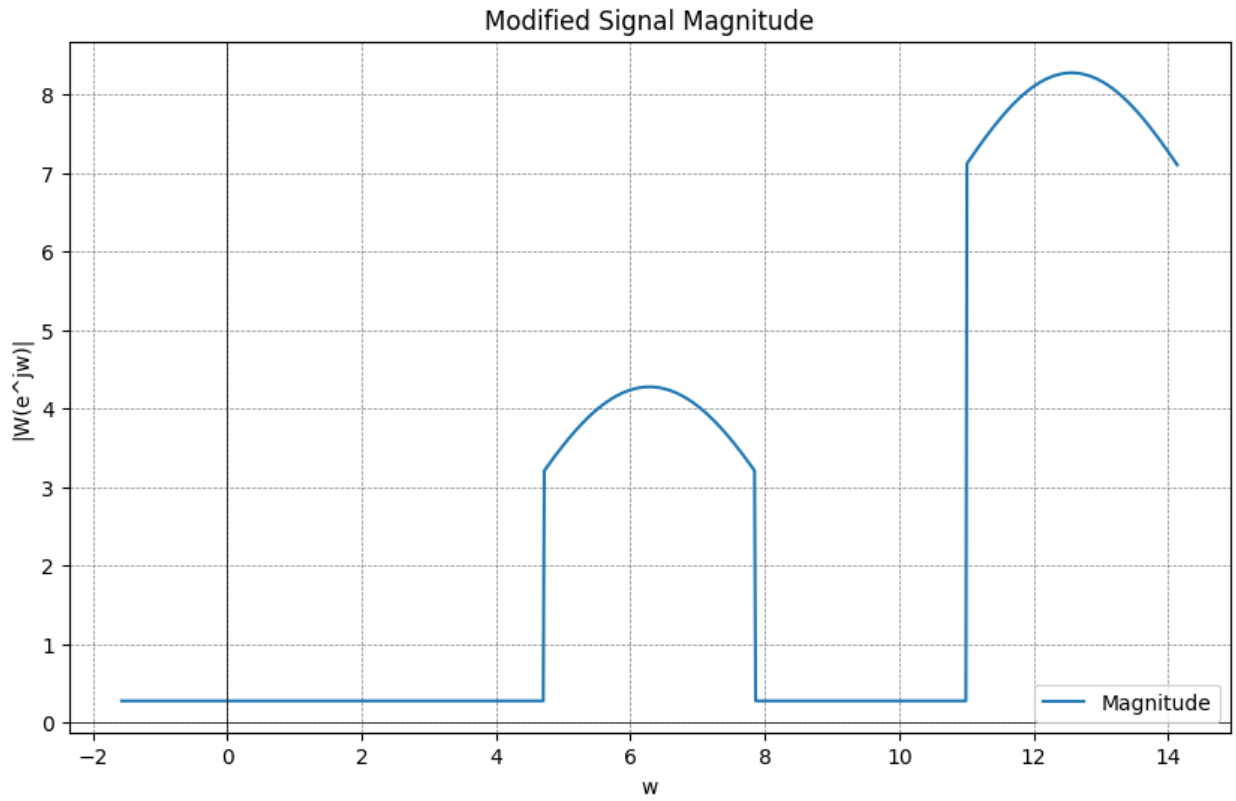

Modified Signal Magnitude
|W(e^jw)|
w
Magnitude
0
1
2
3
4
5
6
7
8
−2
0
2
4
6
8
10
12
14

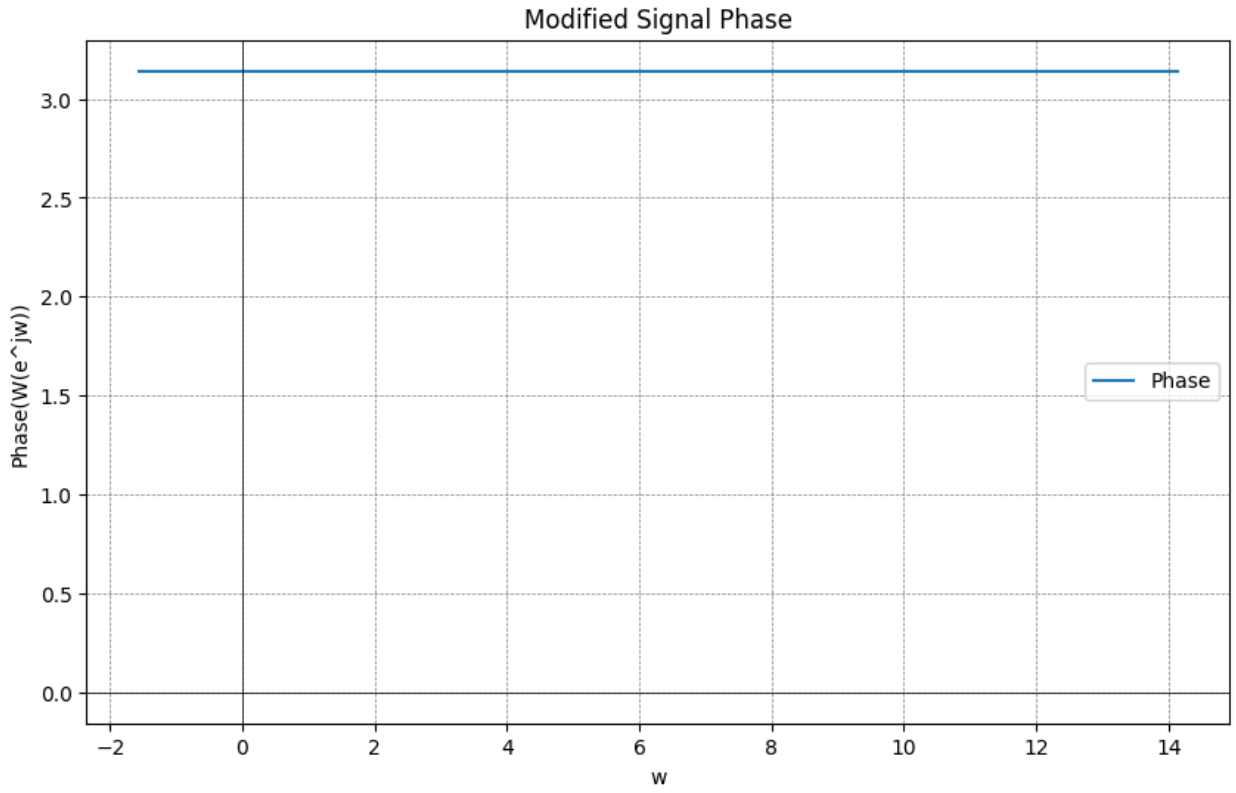

Modified Signal Phase
Phase(W(e^jw))
w
Phase
0.0
0.5
1.0
1.5
2.0
2.5
3.0
−2
0
2
4
6
8
10
12
14

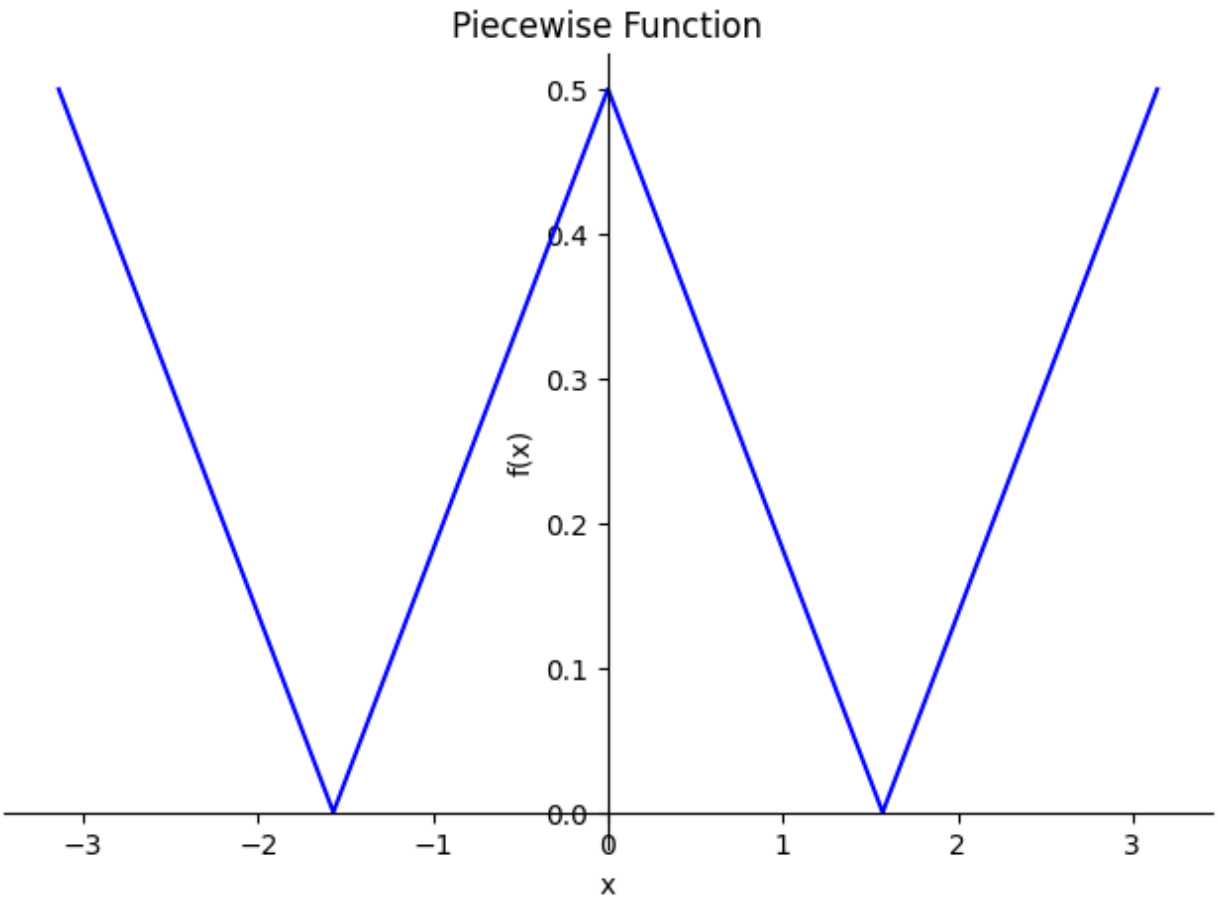

Piecewise Function
0.4
0.2
0.0
−0.2
−0.4
f(x)
x
−4
−3
−2
−1
0
1
2
3
4

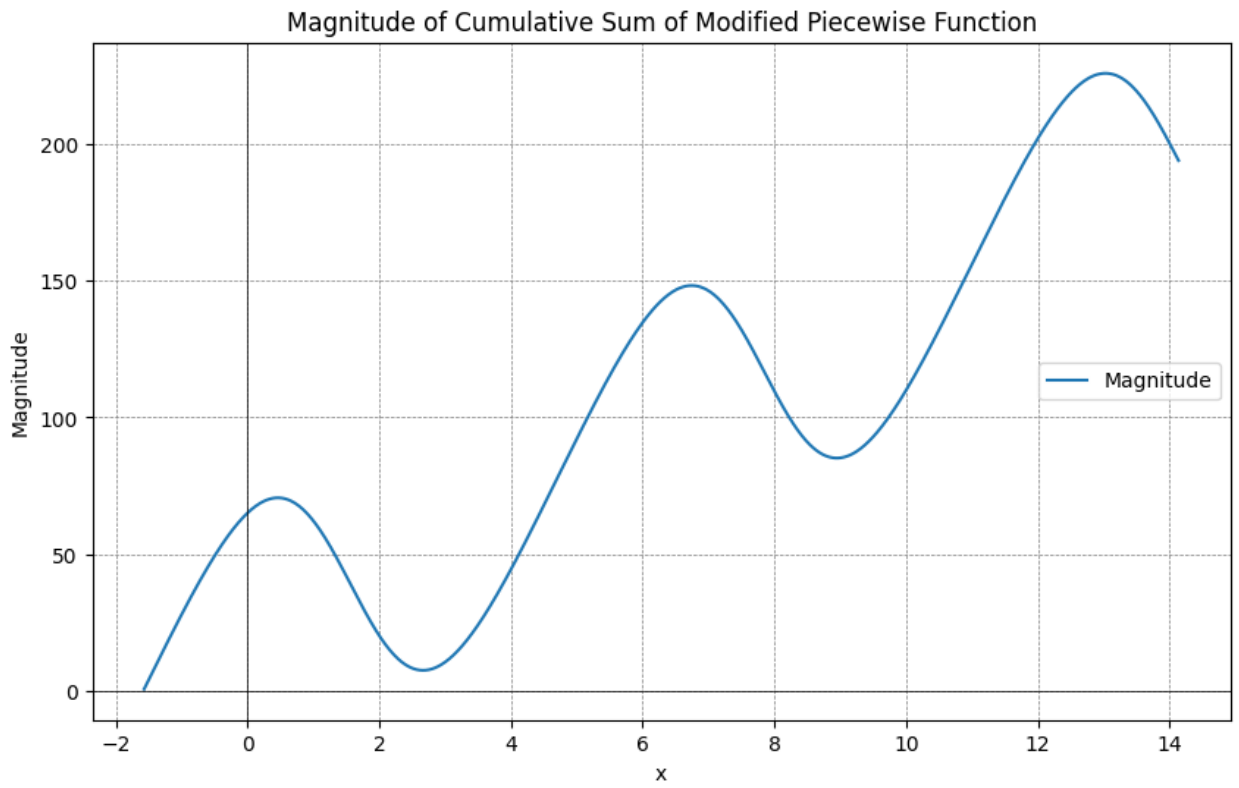

Modified Signal Real Part
0.00
−0.05
−0.10
−0.15
−0.20
−0.25
Re{W(e^jw)}
Real Part
−2
0
2
4
6
8
10
12
14
w

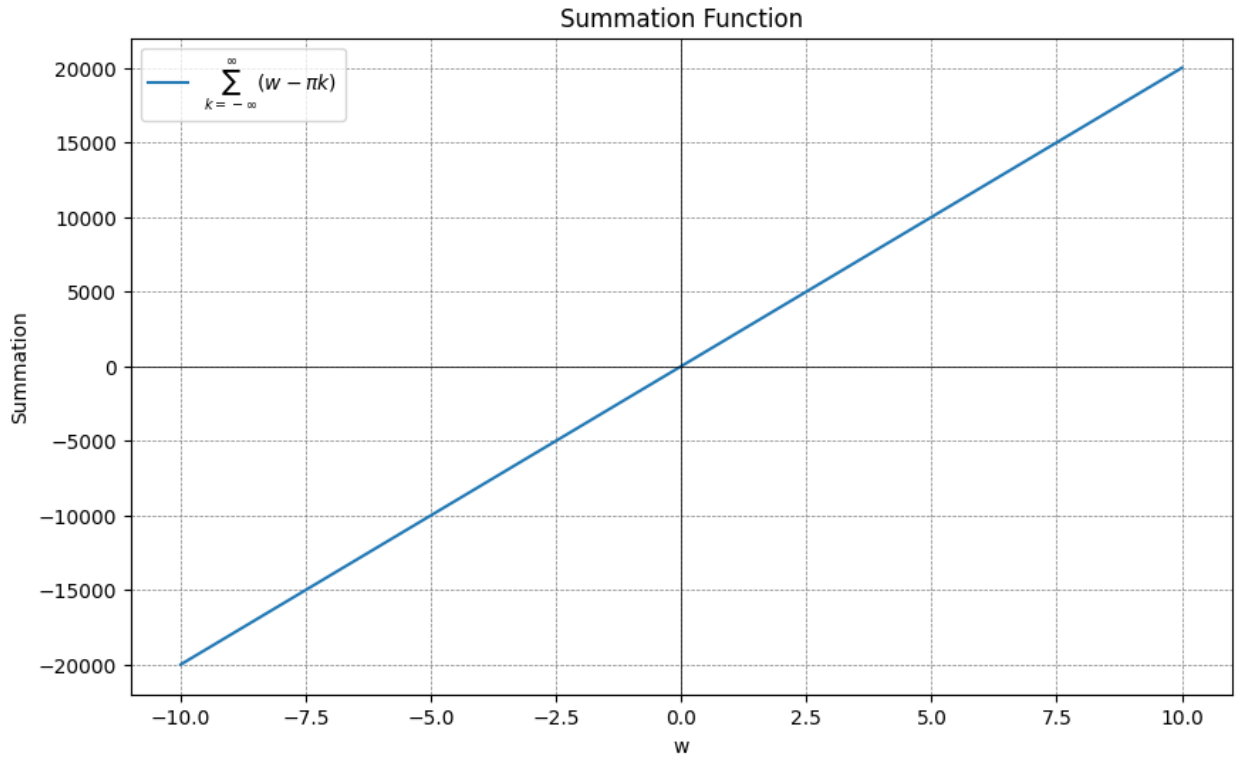

Modified Signal Imaginary Part
1e−16
3
2
1
0
−1
−2
−3
−4
Im{W(e^jw)}
Imaginary Part
−2
0
2
4
6
8
10
12
14
w

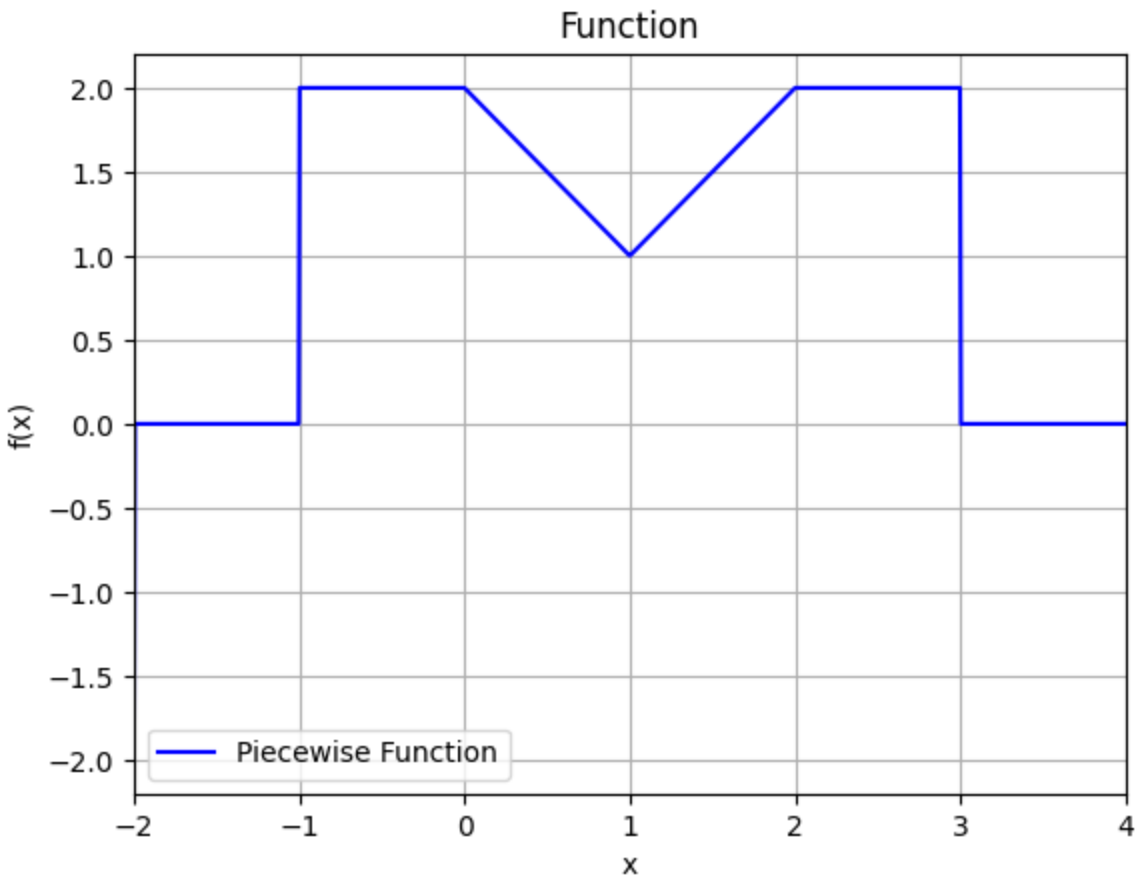

Modified Signal Magnitude
|W(e^jw)|
w
Magnitude
0
1
2
3
4
5
6
7
8
−2
0
2
4
6
8
10
12
14

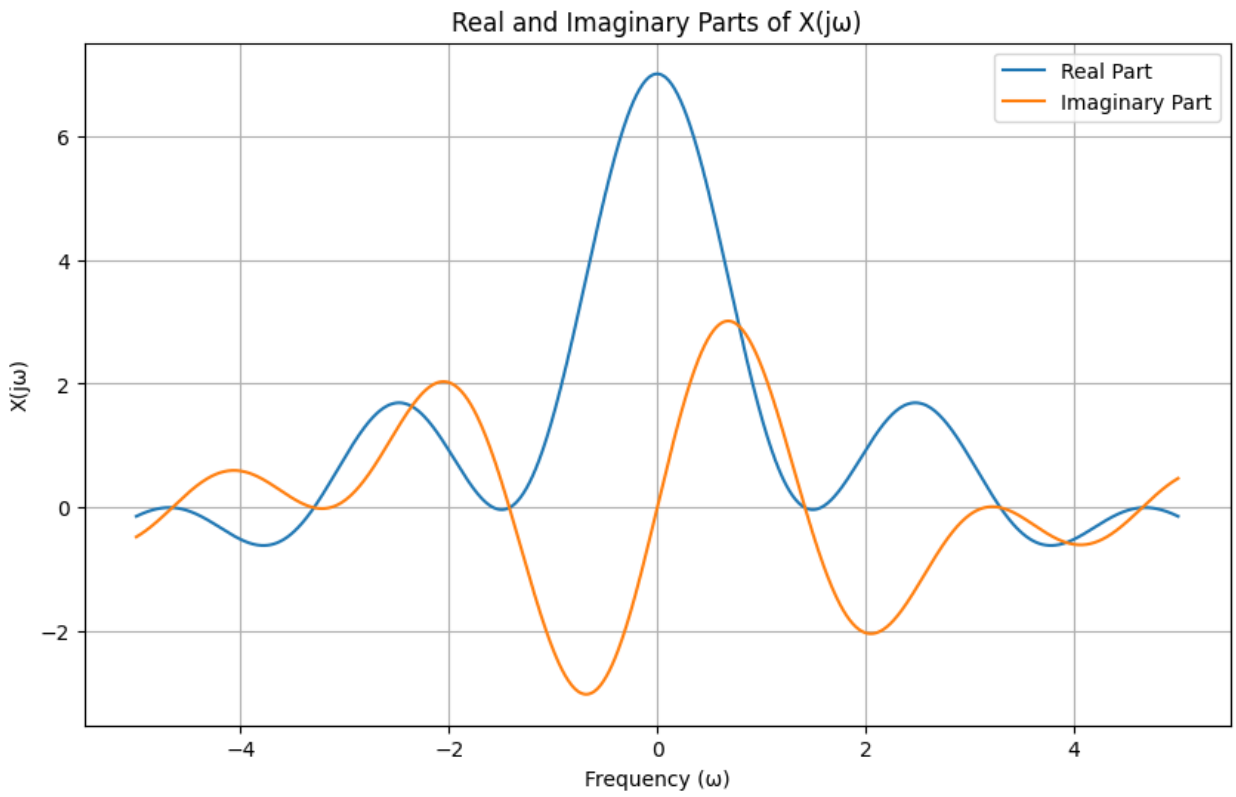

Modified Signal Phase
Phase(W(e^jw))
w
Phase
0.0
0.5
1.0
1.5
2.0
2.5
3.0
−2
0
2
4
6
8
10
12
14

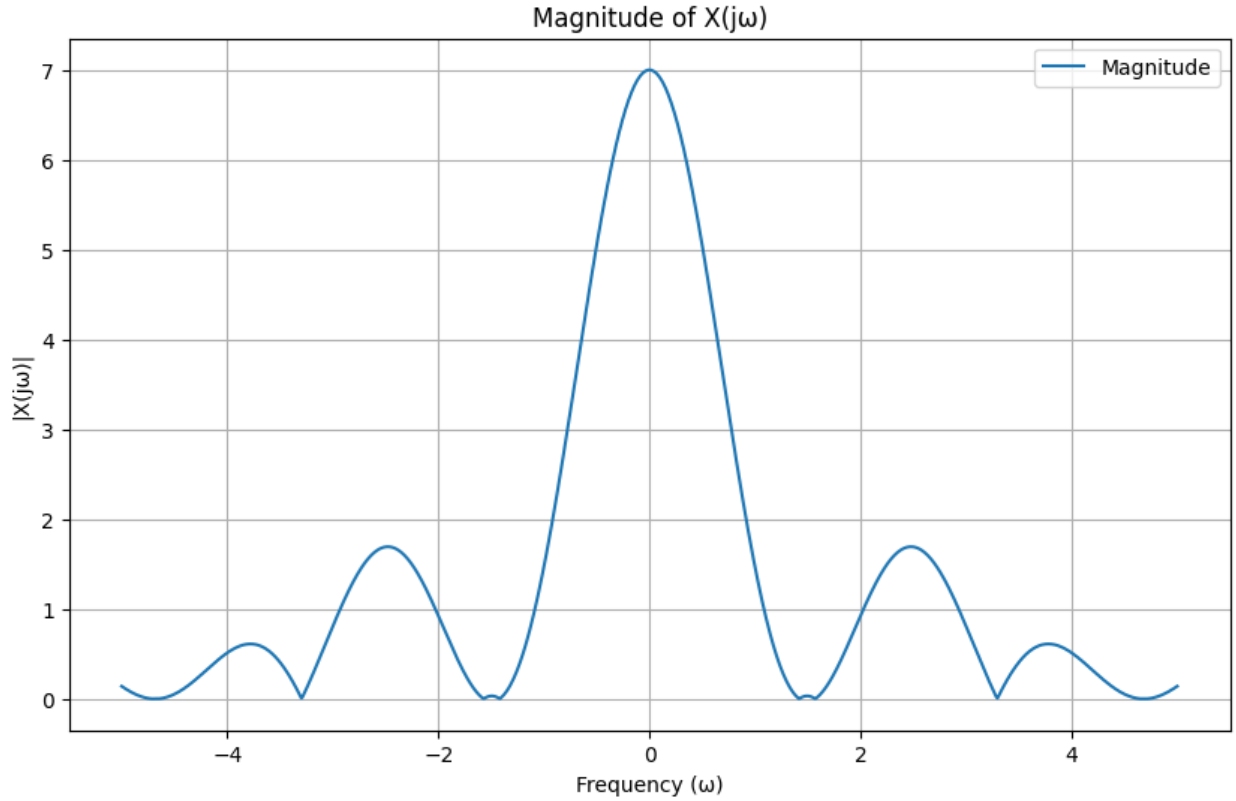

Piecewise Function
0.5
0.4
0.3
0.2
0.1
0.0
f(x)
−3
−2
−1
0
1
2
3
x

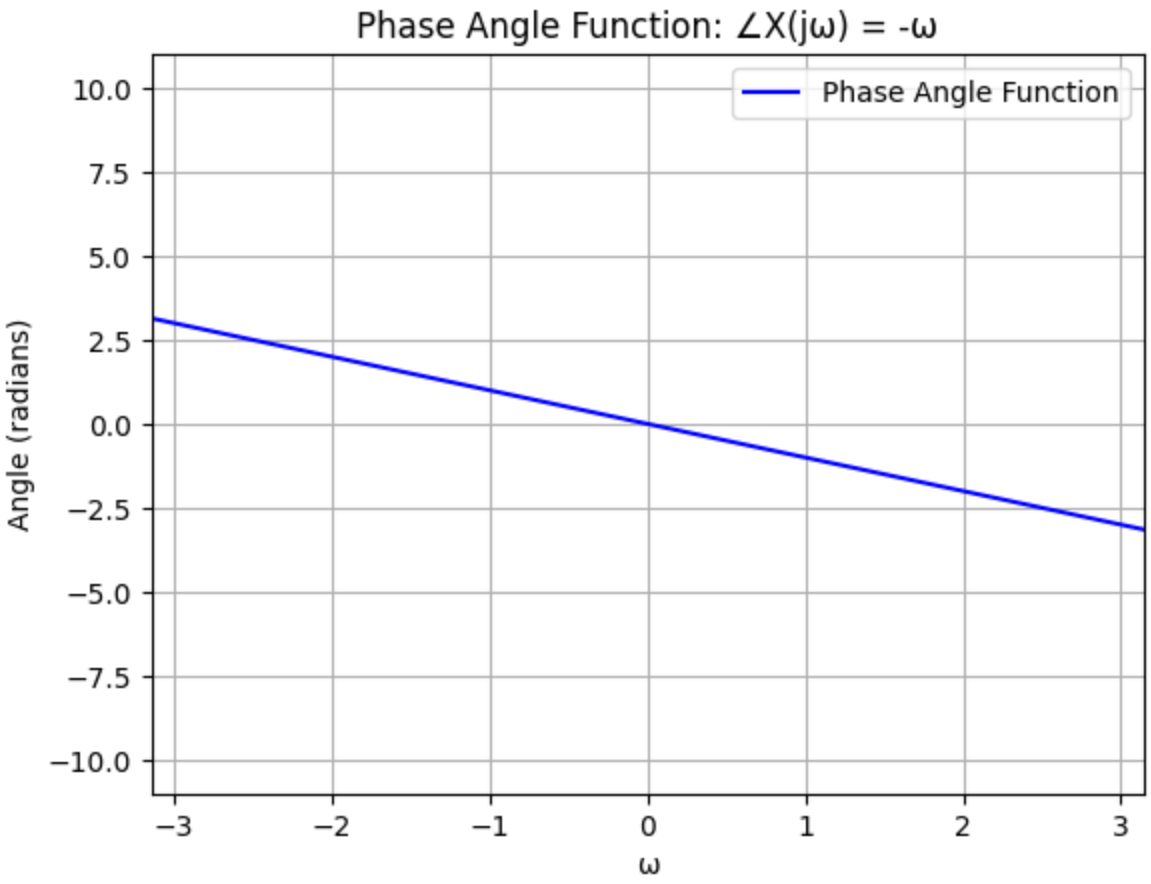

Magnitude of Cumulative Sum of Modified Piecewise Function
Magnitude
x
Magnitude
200
150
100
50
0
−2
0
2
4
6
8
10
12
14

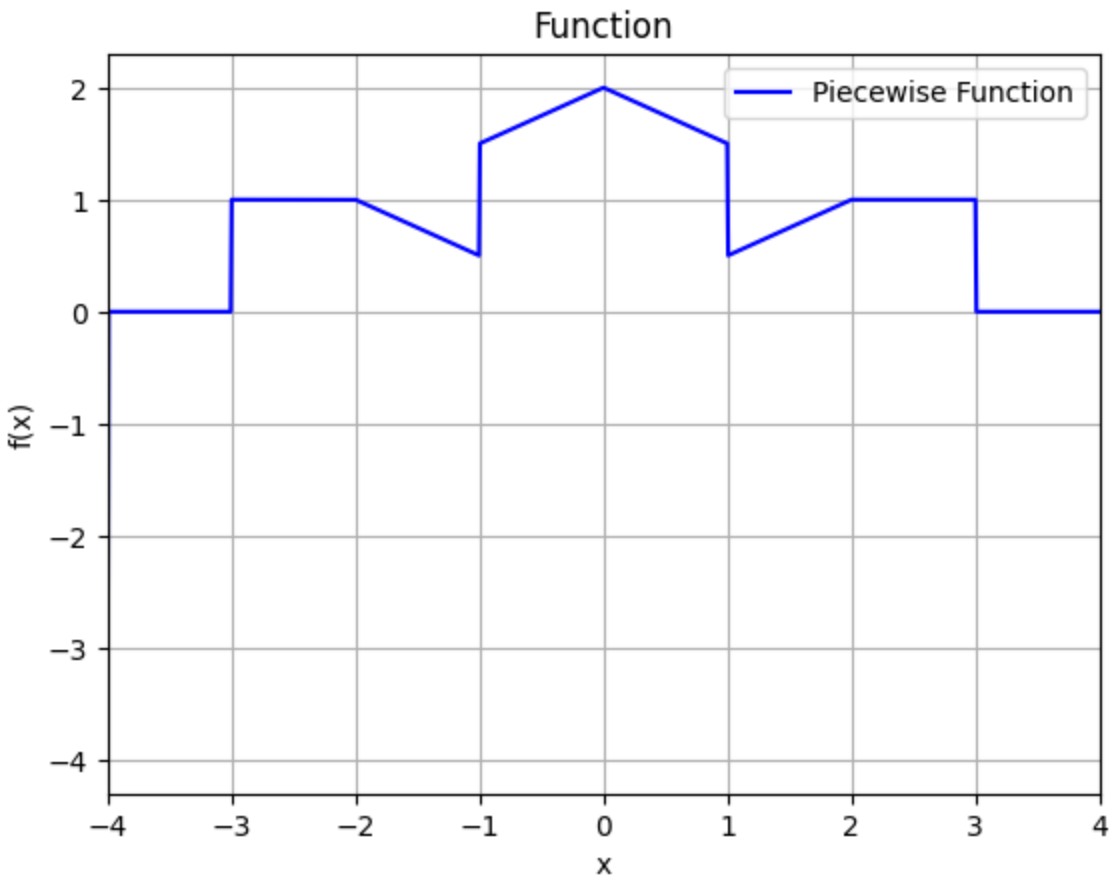

Summation Function
Summation
w
$\sum_{k=-\infty}^{\infty} (w - \pi k)$
20000
15000
10000
5000
0
−5000
−10000
−15000
−20000
−10.0
−7.5
−5.0
−2.5
0.0
2.5
5.0
7.5
10.0


Function
2.0
1.5
1.0
0.5
0.0
−0.5
−1.0
−1.5
−2.0
f(x)
−2
−1
0
1
2
3
4
x
Piecewise Function


Real and Imaginary Parts of X(jω)
Real Part
Imaginary Part
X(jω)
Frequency (ω)


Magnitude of X(jω)
Magnitude
|X(jω)|
Frequency (ω)


Phase Angle Function: ∠X(jω) = -ω
Phase Angle Function
Angle (radians)
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
−3
−2
−1
0
1
2
3
ω


Function
Piecewise Function
f(x)
x
2
1
0
−1
−2
−3
−4
−4
−3
−2
−1
0
1
2
3
4