

Question

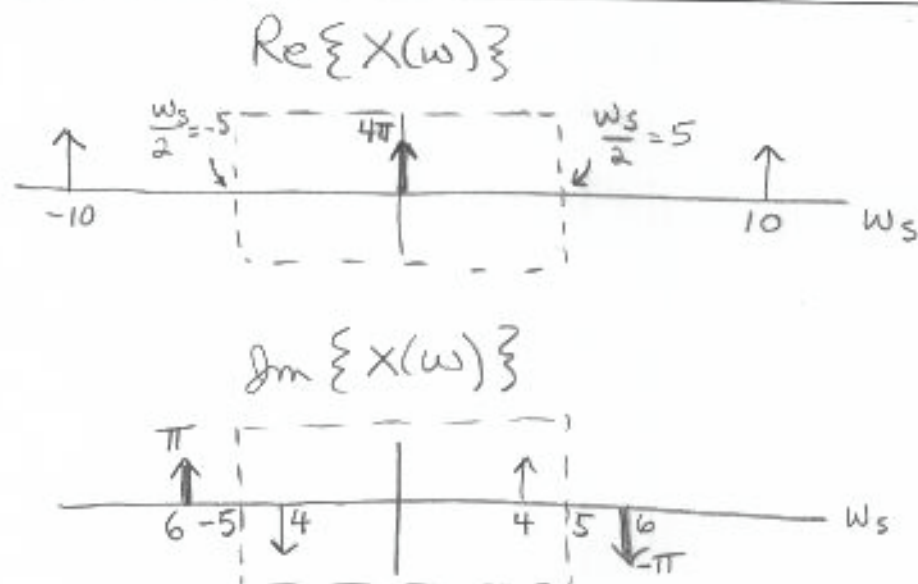
$$x(t) = 2 + \sin(6t)$$

$$\omega_s = 10$$

Draw $X(\omega)$, indicating baseband
hint: Draw both the real
and imaginary parts
of $X(\omega)$

Does aliasing occur?
If so, what is aliased signal?

Answer



aliased signal is $2 - \sin(4t)$

Question

$$x(t) = \cos(4t) + \sin(4t)$$

$$\omega_s = 6$$

Draw both the real and imaginary parts of $X(\omega)$

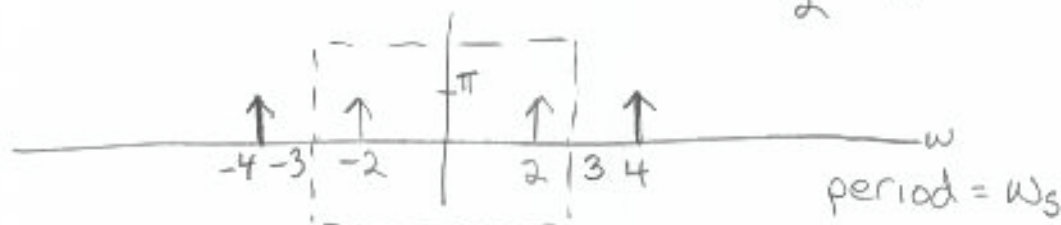
Does aliasing occur?

If so, what is the aliased signal?

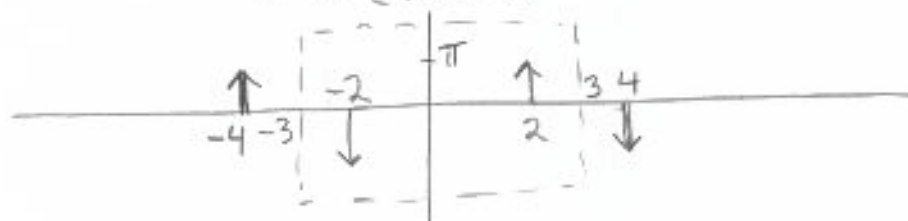
Answer

$$\text{Re} \{X(\omega)\}$$

$$\frac{\omega_s}{2} = 3$$



$$\text{Im} \{X(\omega)\}$$



$$\text{aliased signal} = \cos(2t) - \sin(2t)$$

Question

$$x(t) = 1 + \sin(2t) - \cos(4t)$$

Sampling Frequency $\omega_s = 6$

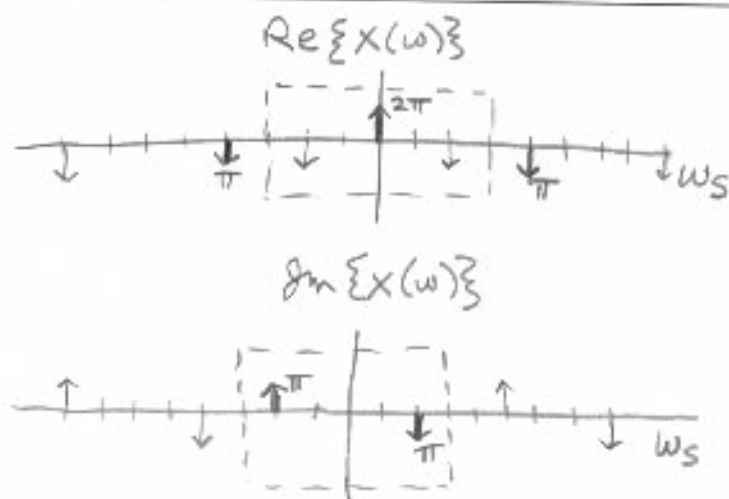
Graph the real and imaginary parts of the Fourier Transform of the sampled signal.

Does Aliasing occur?

If so, what is the aliased signal?

At what period does the spectrum repeat?

Answer



aliasing does occur

aliased signal is

$$1 + \sin(2t) - \cos(2t)$$

period of spectrum is $\omega_s = 6$

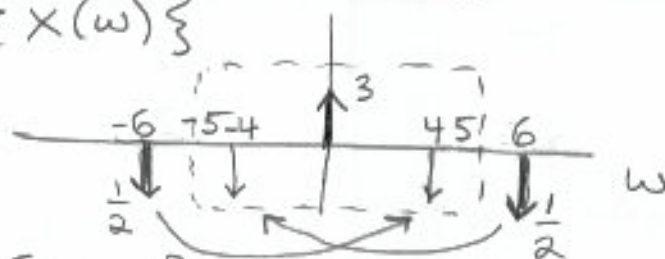
Question

A signal $x(t) = 3 - \cos(6t)$ is sampled at $\omega_s = 10$ what is the Nyquist Frequency? Do you expect aliasing? Plot the real and imaginary parts of $x(\omega)$ drawing a box around the base-band. If aliasing occurs, what is The aliased signal (time domain)?

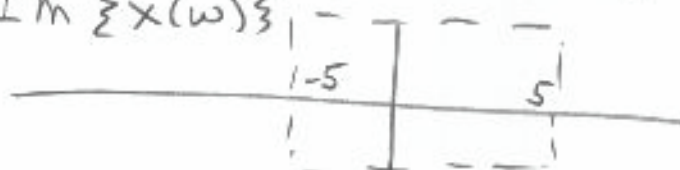
Answer

Nyquist Frequency = $\frac{10}{2} = 5$
 $6 > 5 \Rightarrow$ aliasing will occur

Re $\{x(\omega)\}$



Im $\{x(\omega)\}$



aliased signal is $3 - \cos(4t)$

Use 0.7 mm mechanical pencil. Keep 0.25 inch from edge of box. Erase mistakes thoroughly.

SA5

Problem Type Acronym

Name

ID #

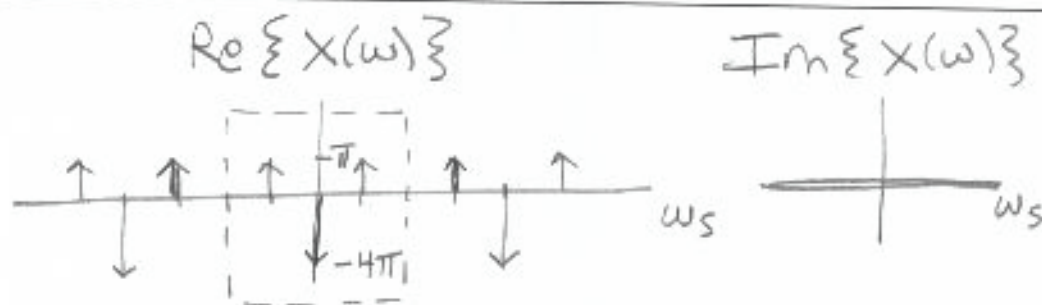
Question

A signal $x(t) = -2 + \cos(3t)$ is sampled at $\omega_s = 4$.

The Fourier Transform $X(\omega)$ of the sampled signal is periodic.

Graph the real and imaginary parts of $X(\omega)$ drawing a box around the base-band $-\frac{1}{2}\omega_s$ to $+\frac{1}{2}\omega_s$. What does the aliased signal appear to be?

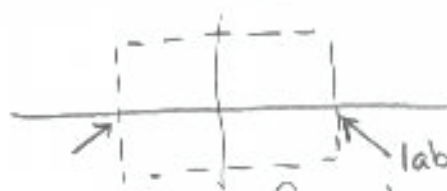
Answer



aliased signal is $-2 + \cos(t)$

Question

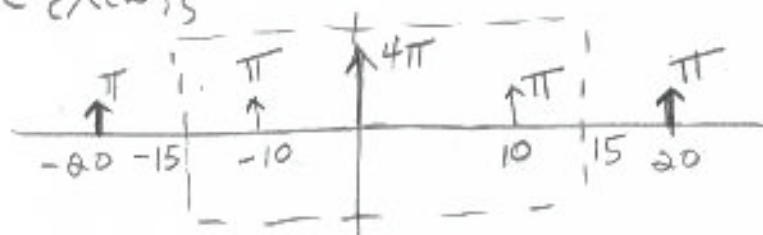
A signal, $x(t) = 2 + \sin 10t + \cos 20t$ is sampled at $\omega_s = 30$. Drawing the real and imaginary parts of $X(\omega)$ in a "base band" diagram (labeling key points)



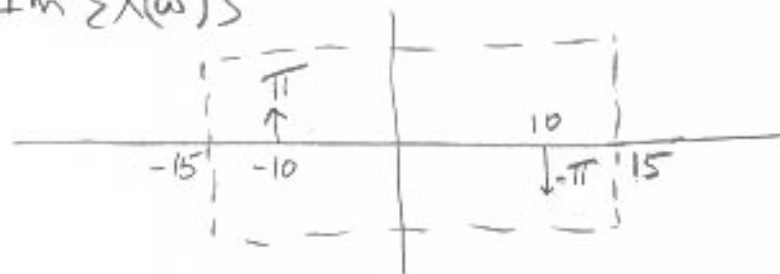
write an equation for how $x_s(t)$ will appear in the base band, $x_s(t)$
Has aliasing occurred?

Answer

$\text{Re}\{X(\omega)\}$



$\text{Im}\{X(\omega)\}$



$x_s(t) = 2 + \sin 10t + \cos 5t$
yes, aliasing has occurred.