

What are those Negative Frequencies?!

Recall: every real sinusoid can be thought of as being made from two complex sinusoids:

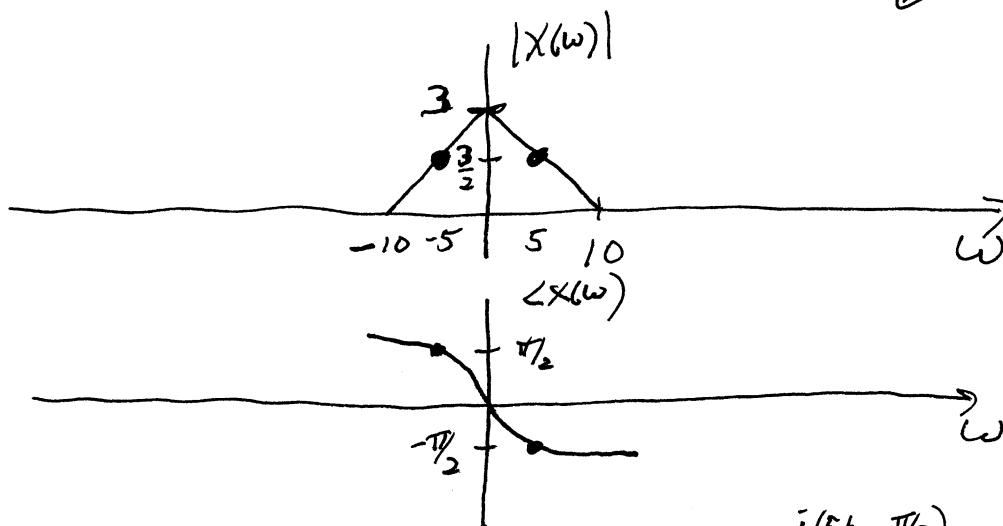
- one w/ positive freq.
- one w/ negative freq.

$$A \cos(\omega_0 t + \phi) = \underbrace{\frac{A}{2} e^{j(\omega_0 t + \phi)}}_{\substack{\text{comp. sinusoid} \\ \text{w/ pos. freq.}}} + \underbrace{\frac{A}{2} e^{j(-\omega_0 t - \phi)}}_{\substack{\text{comp. sinusoid} \\ \text{w/ neg. freq.}}}$$

$\uparrow \omega_0 > 0$

These positive & negative freq. components show up in the: 1. Complex FS coefficients

2. Fourier Transform } Illustrate for FT



The dots above represent: $\frac{3}{2} e^{j(5t - \pi/2)}$ and $\frac{3}{2} e^{j(5t + \pi/2)}$

which combine to make: $3 \cos(5t - \pi/2)$

This is the physical sinusoidal component related to these mathematical components