

10-17-07

Note Title

10/17/2007

Fourier analysis

warmup exercise

$$\sin(a \pm b) = \sin a \cos b \pm \cos a \sin b$$

$$\cos(a \pm b) = \cos a \cos b \mp \sin a \sin b$$

Sum of two sinusoids with almost the same frequency?

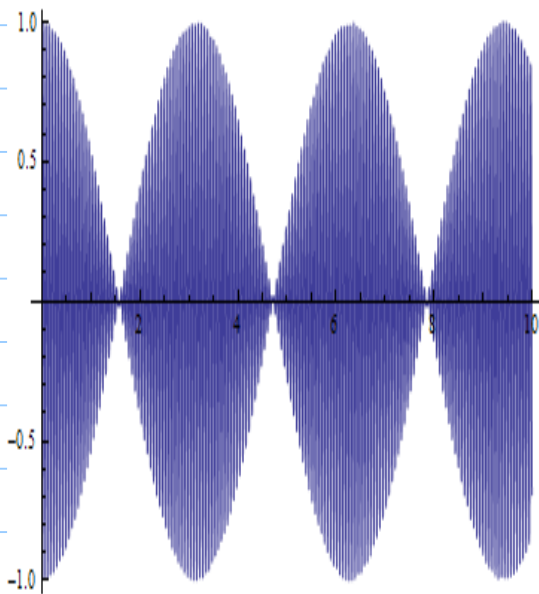
$$\sin((\omega - \epsilon)t) + \sin((\omega + \epsilon)t)$$

\downarrow $\sin \omega t \cos \epsilon t + \cos \omega t \sin \epsilon t$

$$\sin \omega t \cos \epsilon t - \cos \omega t \sin \epsilon t$$

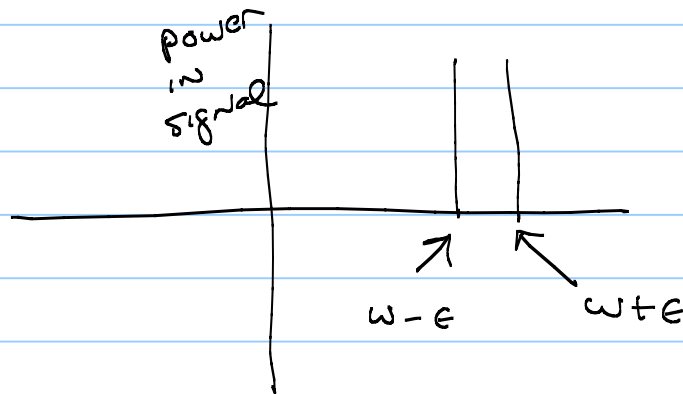
$= 2 \sin \omega t \cos \epsilon t$

By assumption ϵ is a small number so $\sin \omega t \cos \epsilon t$ looks like



Remember, there are only 2 frequencies present

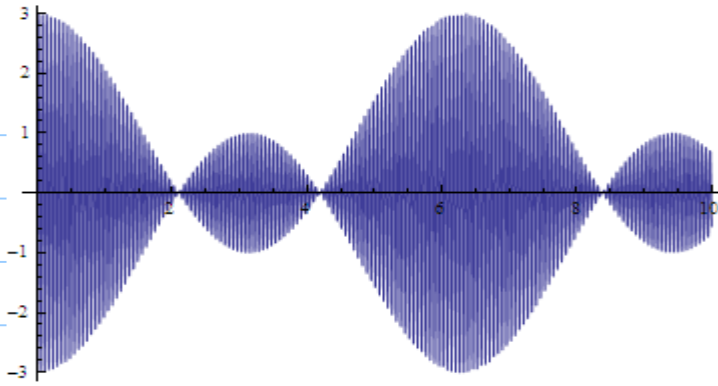
$\omega - \epsilon$, $\omega + \epsilon$
 so if we plot the power versus frequency



This is called amplitude modulation

Try this:

$$\begin{aligned} & \sin(\omega t) + \underbrace{\sin((\omega - \epsilon)t) + \sin((\omega + \epsilon)t)}_{2\sin\omega t \cos\epsilon t} \\ = & (1 + 2\cos\epsilon t) \sin\omega t \end{aligned}$$



$$(5 + 2\cos 2t) \sin \omega t$$

