

* A special class of signals

CT, complex exponential signals.

To study this signal, write

Then

Let us study the terms separately & then put them together.

Term 1: $|C|$ simply scales the signal

Term 2: $e^{\sigma t}$ (real exponential)

$$\sigma = 0$$

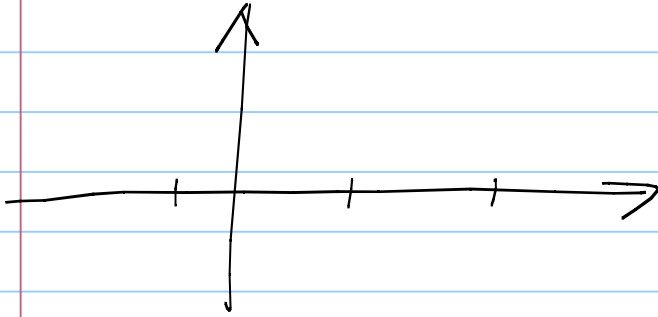
$$\sigma > 0$$

$$\sigma < 0$$

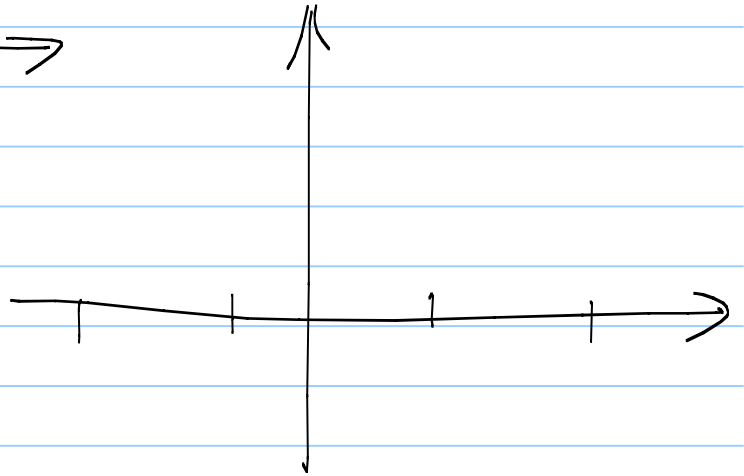
Term 3: $e^{j(\omega t + \phi)}$

Q: How to plot $e^{j(\omega t + \phi)}$?

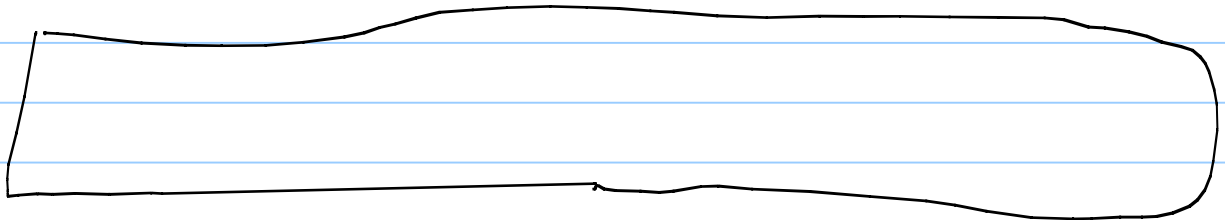
Real Part :



Imaginary part :



ω : omega is called the frequency
Smaller $\omega \rightarrow$ slower oscillation
larger $\omega \rightarrow$ faster oscillation



ϕ : is called the phase since it
 changes the angle of each sinusoidal

Combine all terms together

Q: Find the (x, y) coordinates of points ①, ②, ③?

Ans:

Q: What is the instantaneous power of $x(t) = |c|e^{\sigma t} e^{j(\omega t + \phi)}$

Ans:

* CT harmonically related complex exponentials (HRCEs)

— For any ω , how many CT HRCEs do we have?

Ans:

— All these signals are periodic

— Their fundamental freq are _____
fundamental periods are _____