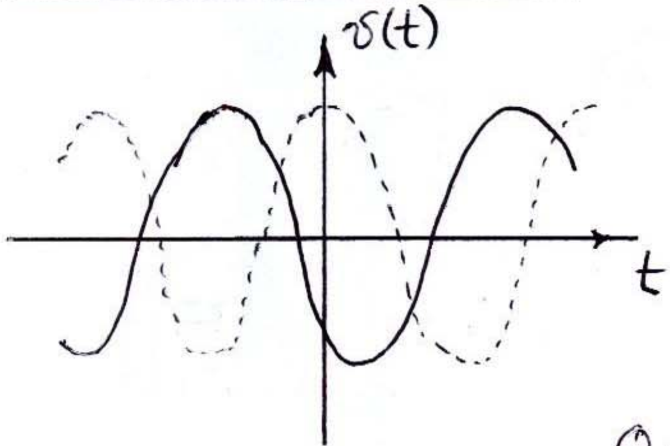
P3360/AEP3630

Lecture 7

Linear AC circuits



$$v(t) = V_0 \cos(\omega t + \varphi)$$

Q: why study AC (sine) response?

1)

Q: if you have ________ network, what shape on input remains the same on the output?

2)

3) superposition:

Complex notation

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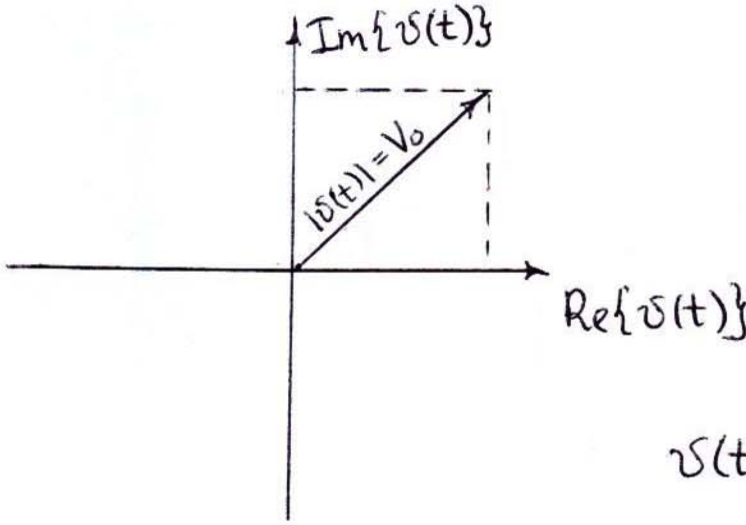

Euler formula

$e^{j\alpha} = \cos\alpha + i\sin\alpha$

$j^2 \equiv -1$

$v(t) =$

Usually simply write $v(t) =$

Time vs. freq. domain analysis

Time domain: $v(t), i(t)$

KVL & KCL $\Rightarrow$

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Freq. domain: $V(\omega), I(\omega)$

$\frac{d}{dt}(e^{j\omega t}) \rightarrow$

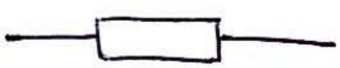
$\int e^{j\omega t} dt \rightarrow$

KVC&KCL $\Rightarrow$

Time domain $\longleftrightarrow$ Freq. domain

- two ways to look
- Fourier analysis :

Complex impedance



Z

$V(\omega) =$

admittance = generalized conductance

Let $i(t) = I_0 e^{j\omega t}$, $v(t) = V_0 e^{j(\omega t + \varphi)}$

$Z(\omega) =$

Impedance can change both ____________________

$$Z = R + jX = Z_0 e^{j\varphi} \, , \Rightarrow$$

Capacitance

$$\frac{dv}{dt} = \frac{i}{C} \, .$$

$$Z_C = \frac{v(t)}{i(t)} =$$

voltage ______ current by $90°$

Inductance

$$v = L \frac{di}{dt}$$

$$Z_L = \frac{v(t)}{i(t)} =$$

voltage ________ current by $90°$ $\longrightarrow i$

	$\omega \to 0$	$\omega \to \infty$
Z_R		
Z_L		
Z_C		