AC CIRCUITS

Saturday, September 3, 2022 12:21 PM

Time Domain is a time quantity
Real quantity
Phasor- domain is independent of time
Complex quantity

- Tranform sinusoids to phasors => for a particular circuit use eith sin or cos for all the conversions in that circuit, Not both.

In AC circuits, current $\neq 0$ (I) even if capacitor's connected

So, $i = C\frac{dV}{dt}$ → V is not constant, so capacitor is not open nor the i.

$\int V(t)\,dt = \frac{V_m \angle \phi}{J\omega}$ | $\frac{dV(t)}{dt} = J\omega \cdot V_m \angle \phi$

Integrating means in phasor domain dividing by $J\omega$ and diff means multiplying by $J\omega$.

DC circuits	AC circuits
1) Resistance (R)	Impedence (Z)
2) Capacitor has ∞	2) $Z_C = \frac{1}{J.\omega.C}$
3) Inductor has 0	3) $Z_L = j\omega L$
	4) $Z_R = R$

Example (capacitor's Z_C):

Calculator

$2 - J\, 1.06 \times 10^{-3}$

My answer :

① $2.000\ldots28 \angle -5.299 \times 10^{-4}$

sir

② $2 \angle -0.03^{\circ}$

impedance is also a c...

$\boxed{2 - J\, 1.06 \times 10^{-3}}$

Polar form

$2 \angle -0.03^{\circ}$

① shift + 2

② option 2

③ (=)

~~Summation~~ do summation using calculator

$V_1 + V_2 = 20 \angle 45^{\circ} + 10 \angle$

$\therefore \square + J \square$

$\therefore \square \angle \theta$

$\frac{1}{J \times 100\pi \times 3}$

①

② $Z_L = J\omega L$

$= J \times 100\pi \times$

③ $Z_C = \frac{1}{J\omega 10}$

write 1J / 1i insted of just J / i

$(0.5 + J)$

$C \cdot (0.5 + 1i)$

$(J \cdot 0.5)^{-1}$

omplex form: $\left(J200\pi + \frac{1}{J200\pi}\right) // \left(\frac{1}{J300\pi}\right) + 2$

C

↳ ① complex mode
② shift + ENG (i) = J
③ write J at the end $(200 \times \pi \times J)$

$60°$

→ radian form
how?

$= \frac{1}{J300\pi}$

way/mins

π: 3.1416
Normal calculation → still rated for later comparison

$2 = J200\pi$

$0\pi \times 2 = \frac{1}{J200\pi}$

Q $\frac{102.67 \angle -65.33°}{1.06 \angle -135°}$

$= 96.86 \angle 67.67°$

Q $\frac{-1.25J}{8 - 1.25J} \times 75 \angle 0°$

$\angle -81.11°$

* $\pm$ ↑

source short

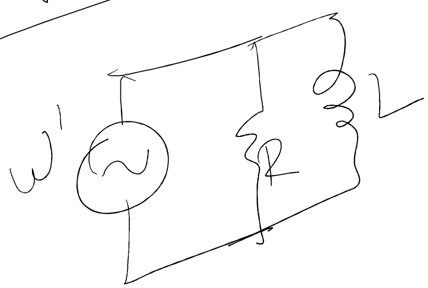
as on open

Example (capaci... Zc)

$Z_C = \frac{1}{JWC}$

$Z_{eq} = \frac{1}{JWC} + R$ [As Zc and R in series]

Ex for inductor



$Z_{eq} = (Z_R \| Z_L)$

$Z_R = R$

$Z_L = JWL$

Nodal Analysis: Hacks

① Divide by each denominator after forming the eq.

$$\frac{V_1 - 75\angle 0^\circ}{4} + \frac{V_1}{J4} + \frac{V_2}{-J1} + \frac{V_2}{2} = 0$$

$$0.25V_1 - 18.75\angle 0^\circ - J0.25V_1 + JV_2 + 0.5V_2 = 0$$

use brackets while
inversing a complex num

$(-10\angle 0^\circ)$

mins mod 90
only fn error
correct by adding

$= 11.58 \angle -81.11^\circ$

Q $0.53 \angle -86.24^\circ \times 6 \angle$

$= 3.18 \angle -86.24^\circ$

$+180^\circ$

Q) $11.58 \angle -81.11 - 90^\circ + $

$\Rightarrow 12.28 \angle -156.1$

$12.28 \cos(5t - 156$

ais on open
ans check
0° (Thermin res
ap iv check)

$3.18 \angle -86.24^\circ$

6°

$.16^\circ)$

$\therefore 0.25 V_1 - 18.75 \angle 0 - \ldots$

2 For solving equations: Cramers Rule

Superposition:

$\omega = 5$

$\omega = 2$

$\omega_1 \neq$

so not

(a) $\underbrace{11.58 \angle -81.11^\circ}_{\sin} + \underbrace{3.18 \angle -86.24^\circ}_{\cos}$ $\times$

can not

$\times$ (b) $11.58 \sin(5t - 81.11^\circ) + 3.18 \cos(\omega t \ldots$

$\leq w_2$

valid

add them if $w_1 \neq w_2$

$-86.240)$

$= 12.28 \cos(3$

$Q \quad -50\angle 30^\circ - 60$

$\Rightarrow \quad -106.28\angle$

$\angle 0^\circ$

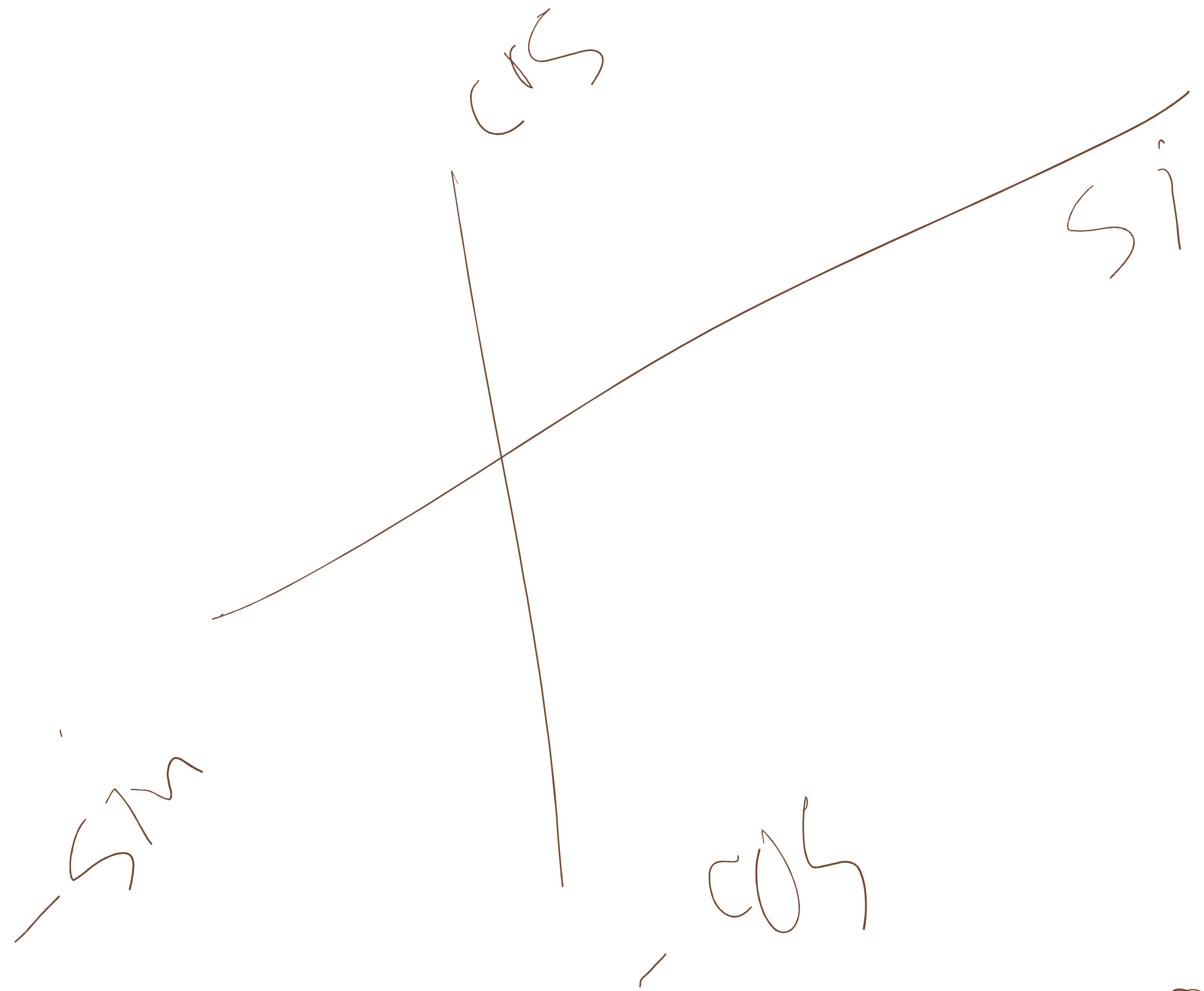
$\underline{13.6^\circ}$

y ⑥ $11.58 \sin(5t - 81'') + 3.18 \cos(\omega x$

if $\omega_1 = \omega_2$:

bring them in the same function first

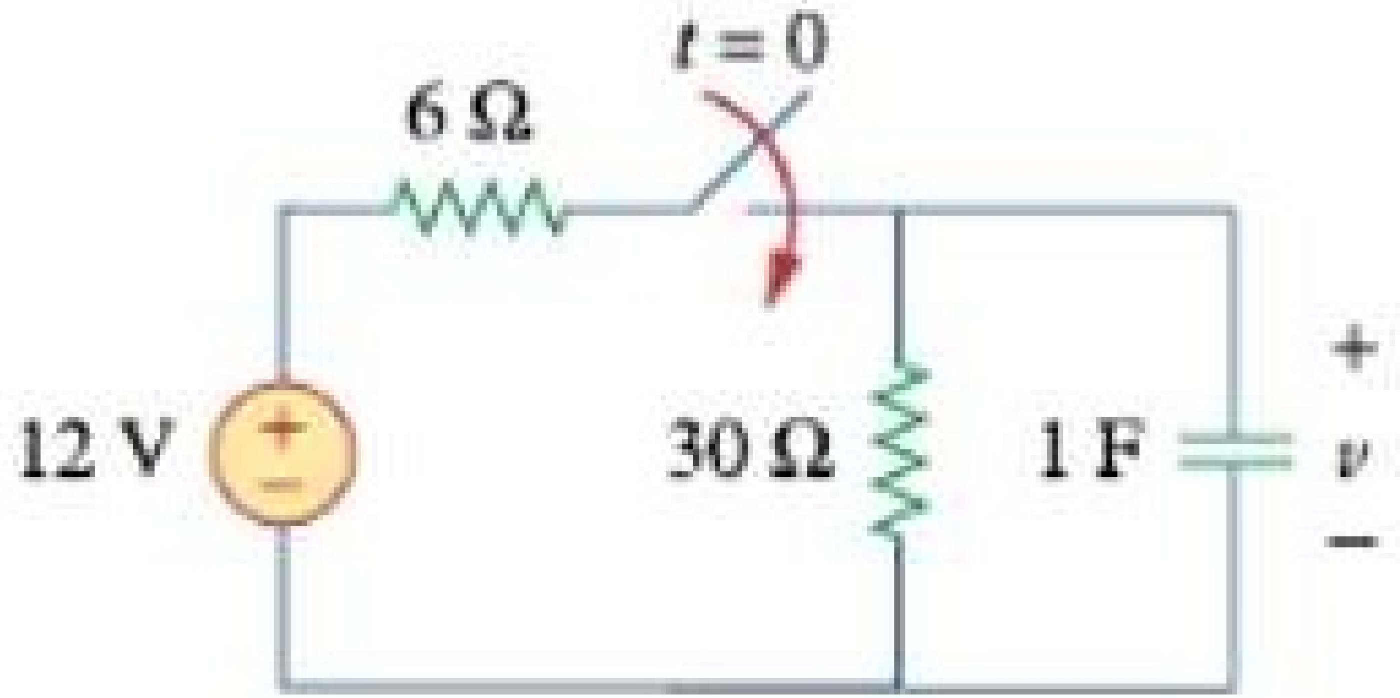
-86.240)



sin(5t - 20

$11\sin($

$= 11\cos($


t = 0
6 Ω
12 V
30 Ω
1 F
+
v
−