

EE301 – Lesson 22

Reading: 15.12 and 16.1-16.3

AC SERIES/PARALLEL CIRCUITS

Learning Objectives

- Determine total impedance of AC parallel and series circuits.
- Apply Ohm's Law, Kirchoff's Voltage Law, voltage divider rule, Kirchoff's Current Law, and current divider rule to AC series parallel networks and its elements.
- Solve AC series parallel networks.

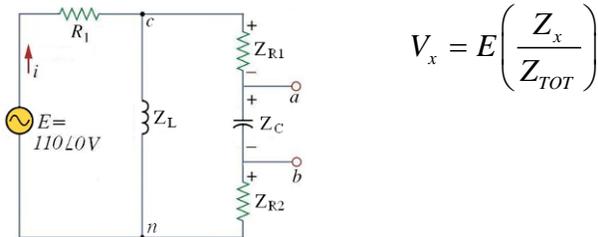
Common Mistakes in AC Analysis

- Confusing X_C and C or X_L and L
- Confusing ω and f when calculating X_C and X_L
- Using V_{PK} and I_{PK} in phasors
- Using V_{RMS} and I_{RMS} in the time domain
- Incorrectly converting from rectangular to polar forms
- Loosing track of signs when adding up impedances

Common Mistake Applying VDR

- Confusing E : E in the VDR is the voltage drop across those impedances in series.
- Using wrong " Z_{TOT} ": Z_{TOT} in the VDR equation refers to just the combination of the impedances resistors that are in series with each other.

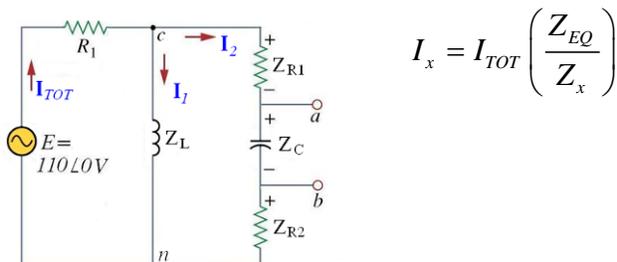
Example: Write a VDR equation that can be used to determine V_{ab} ?



Common Mistake Applying CDR

- Using Z_{TOT} in the CDR instead of Z_{EQ} for the impedance of the parallel branches.
- Not using ALL the series impedances in a branch

Example: What is the equation for I_2 in the circuit below?



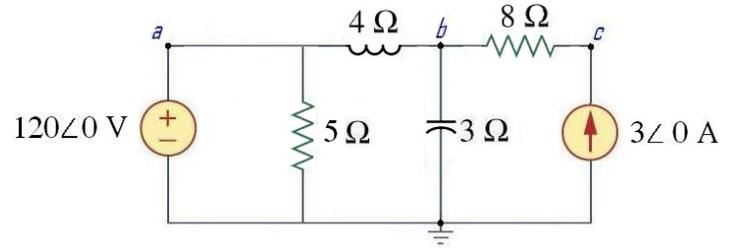
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Example In the circuit below, $V_b = 361 \angle -174^\circ \text{V}$.

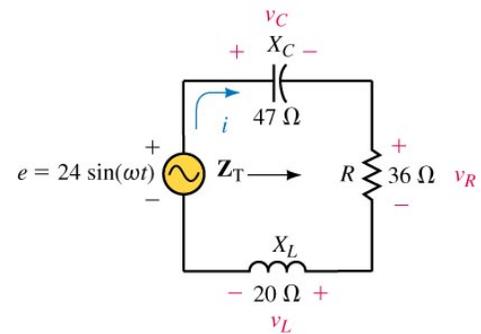
Determine the current through the inductor

Solution:



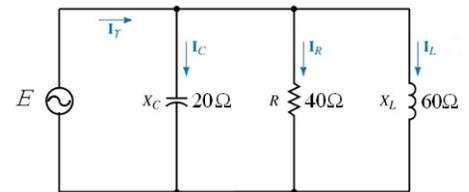
Example For the circuit shown, determine Z_T and V_R

Solution:



Example In the circuit shown, $I_{TOT} = 4.17 \angle 53.13^\circ \text{A}$

- (a) Find the total impedance Z_T .
- (b) Calculate and graph \mathbf{E} , \mathbf{I}_T , \mathbf{I}_C , \mathbf{I}_R , \mathbf{I}_L .

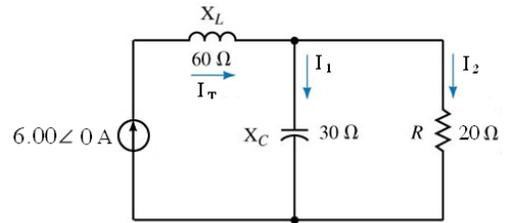


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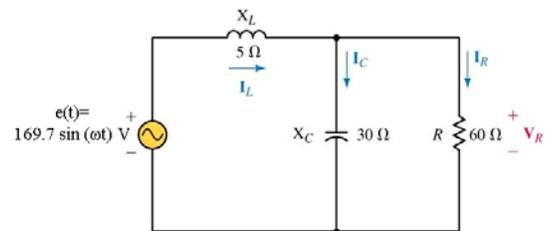
Example Determine I_1 and I_2 .

Solution:



Example For the circuit shown, determine V_R , I_C , I_L and I_R

Solution:

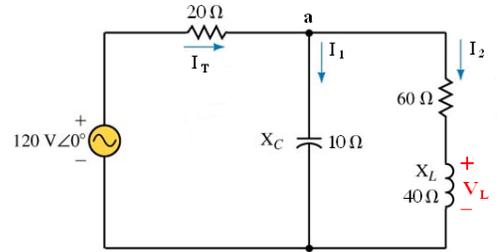


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Example For the circuit shown

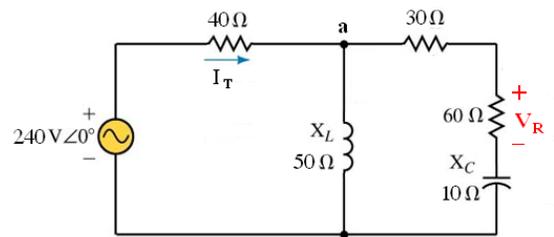
- (a) Determine V_L
- (b) Determine I_2

Solution:



Example For the circuit shown determine V_R using the VDR

Solution:



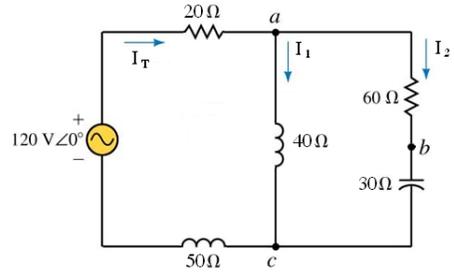
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Example For the circuit shown, assume ground is at the negative terminal of the voltage source.

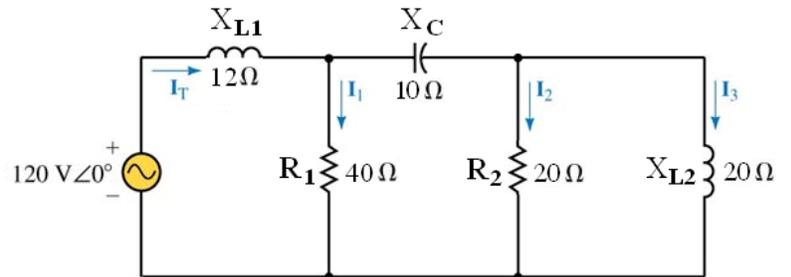
- (a) Find I_2 using the CDR.
- (b) Determine V_a
- (c) Determine V_{ac}

Solution:



Example Use the Current Divider Rule to find I_3 .

Solution:



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Example Determine V_{ab} .

Solution:

