**Chapter 10: Sinusoidal Steady-State Analysis**

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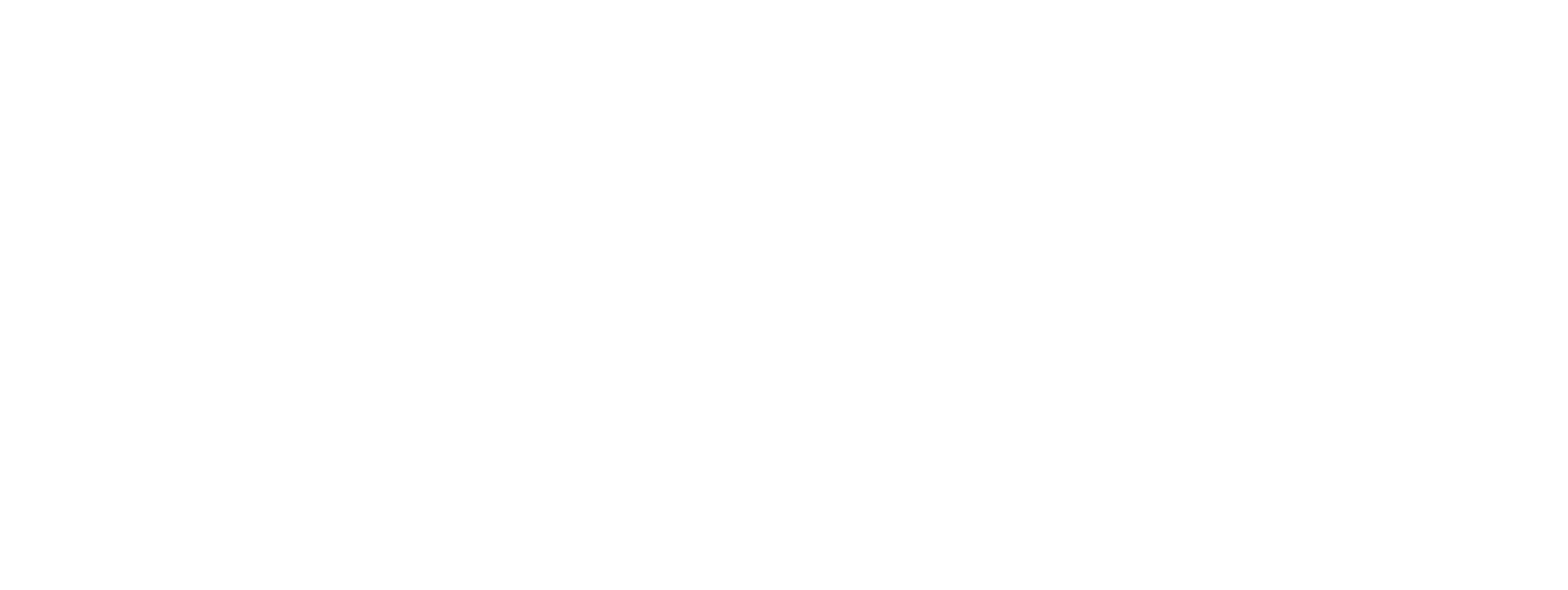
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## 10.2 and 10.3 Nodal and Mesh Analysis

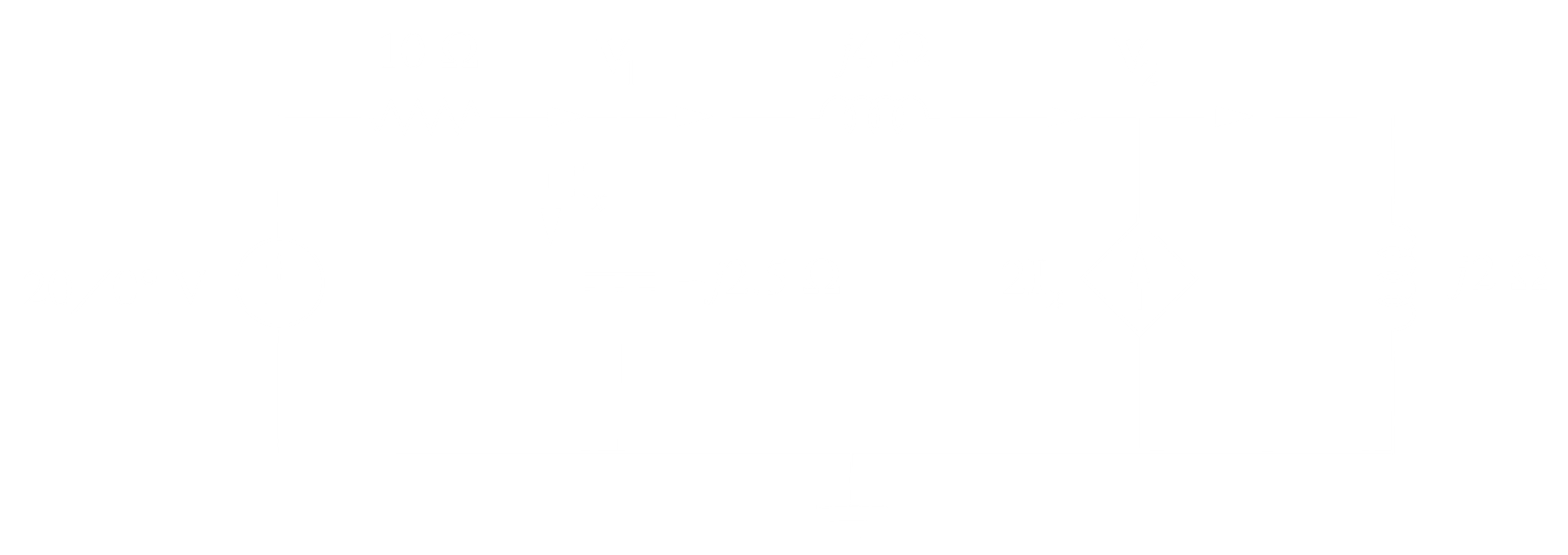


Since , .

For the capacitor,

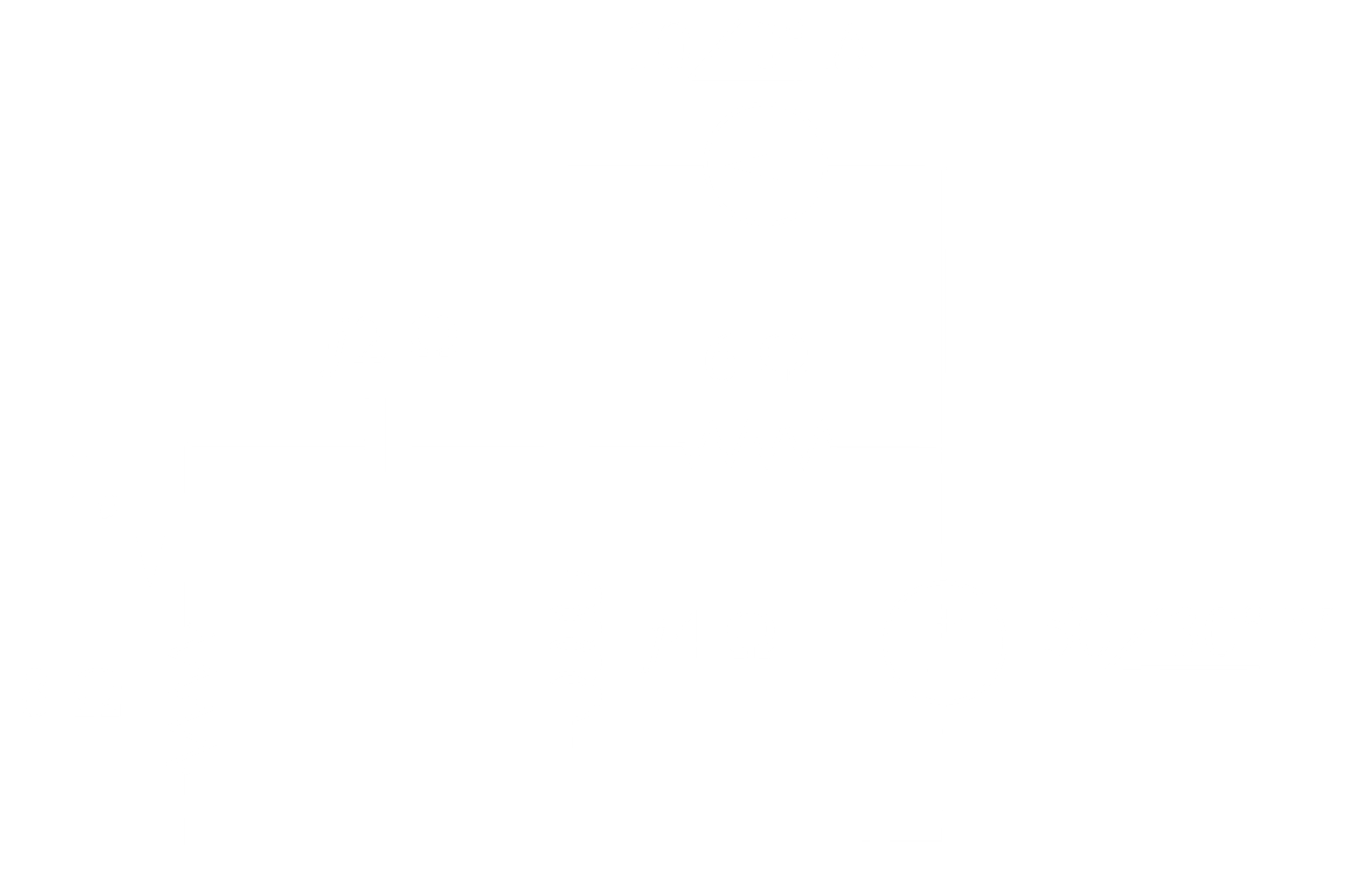
For the inductor,

For the inductor,



Solving the two equations,

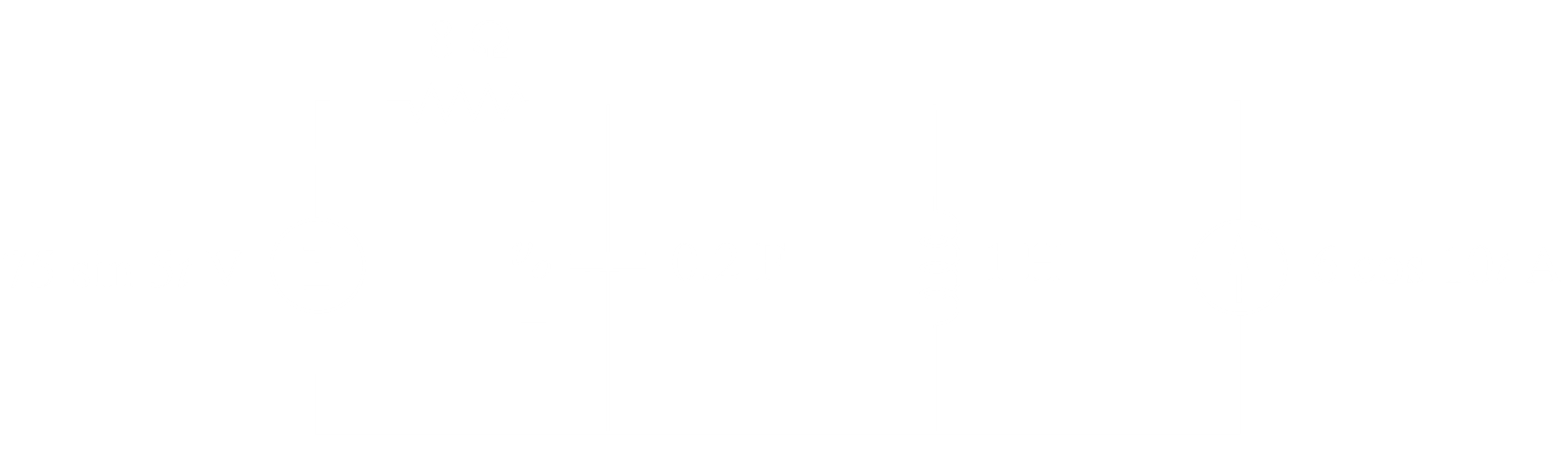
Practice Problem 10.3



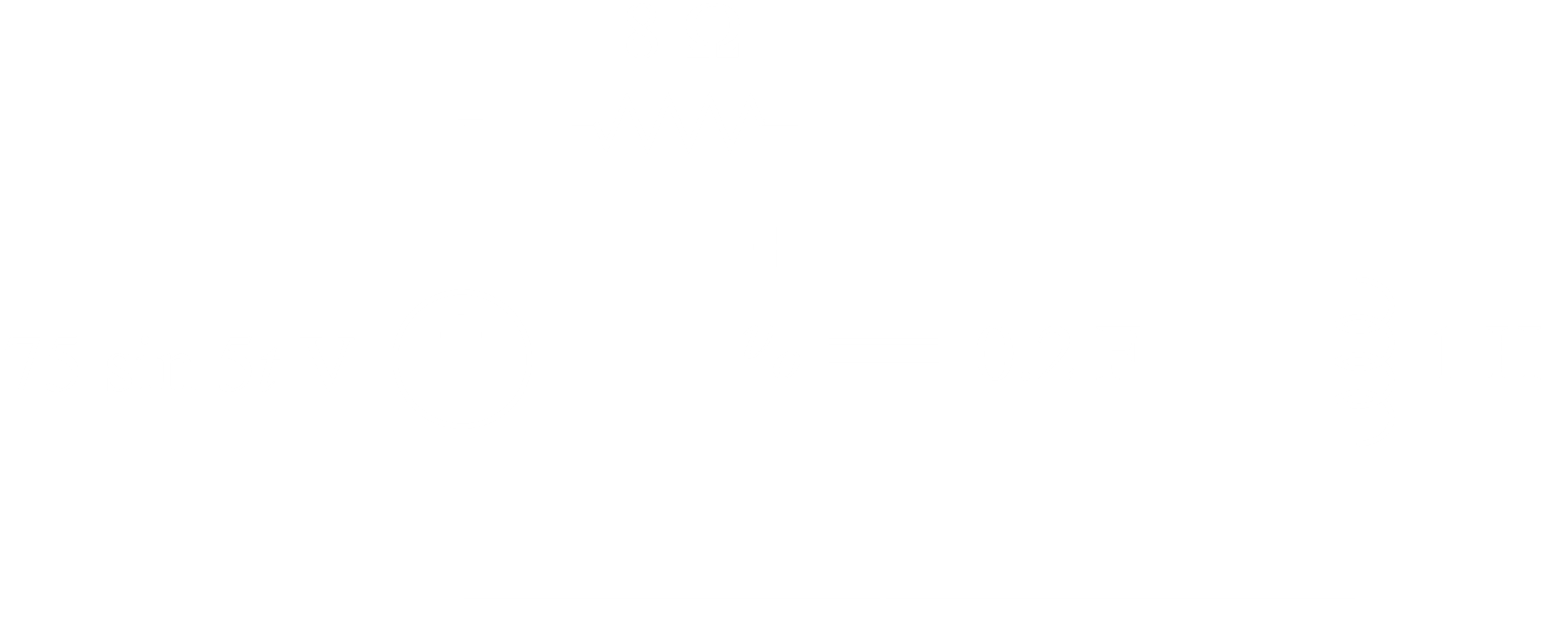
## 10.4 Superposition Principle

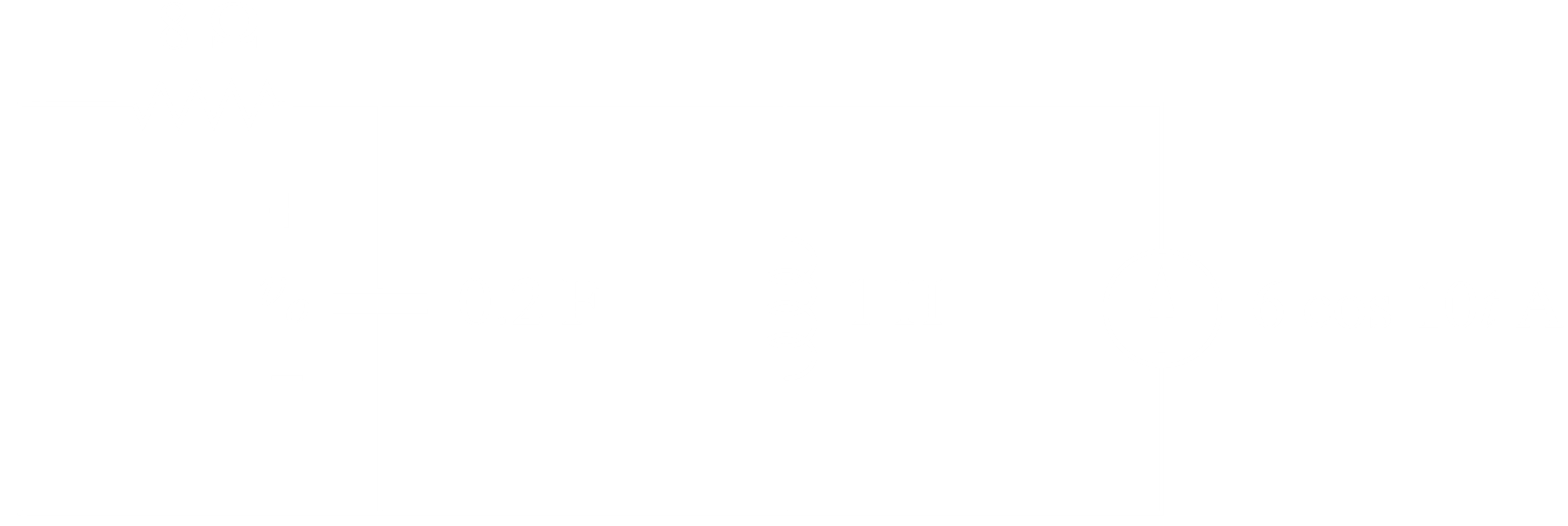
The superposition theorem is the same for AC circuits as it is for DC circuits. It becomes particularly important for sources with different frequencies.

Practice Problem 10.6



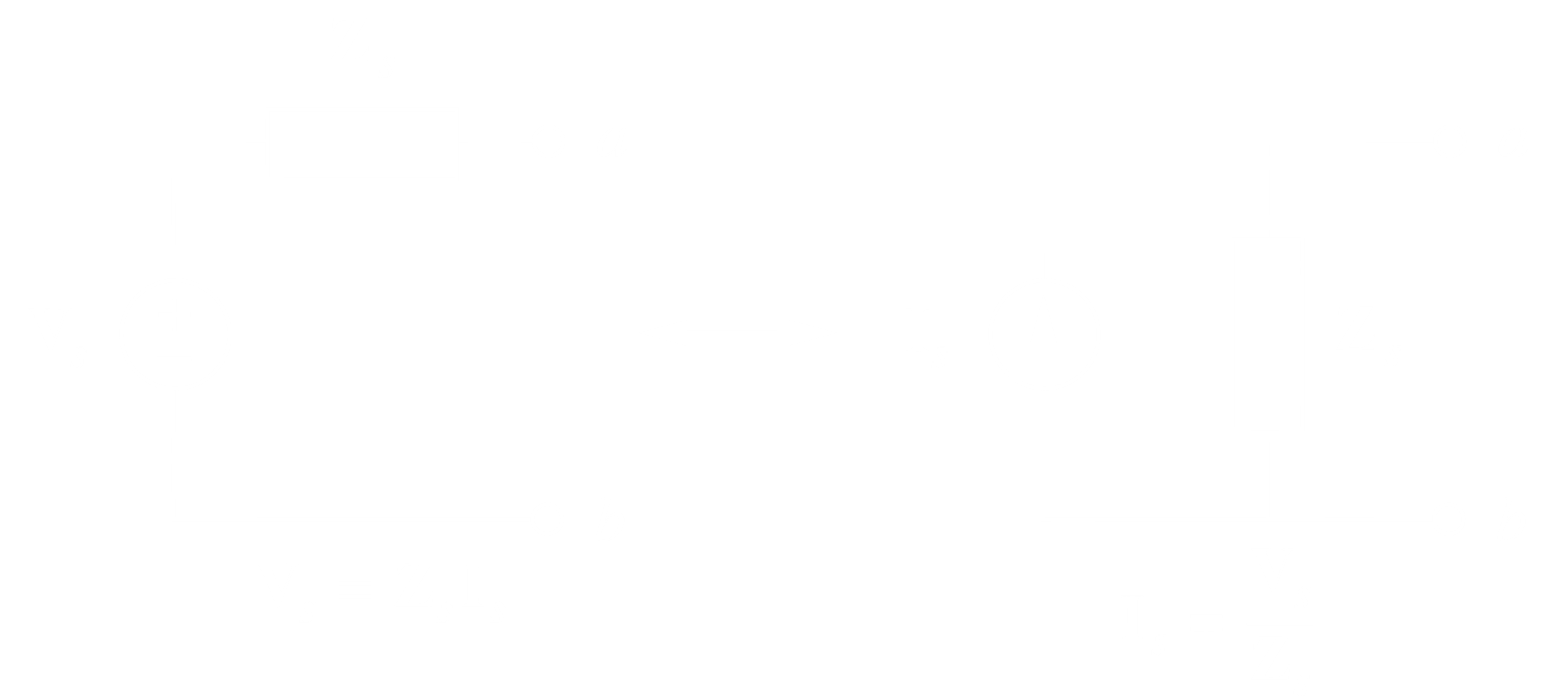
The two sources will result in two separate impedance values for the capacitor and inductor. Nodal analysis cannot be used to solve this problem.





## 10.5 Source Transformation

The process for source transformation in AC circuits is exactly the same as in DC circuits, except that there are capacitors and inductors involved. Thus, the impedance () of a branch must be found instead of just the resistance.

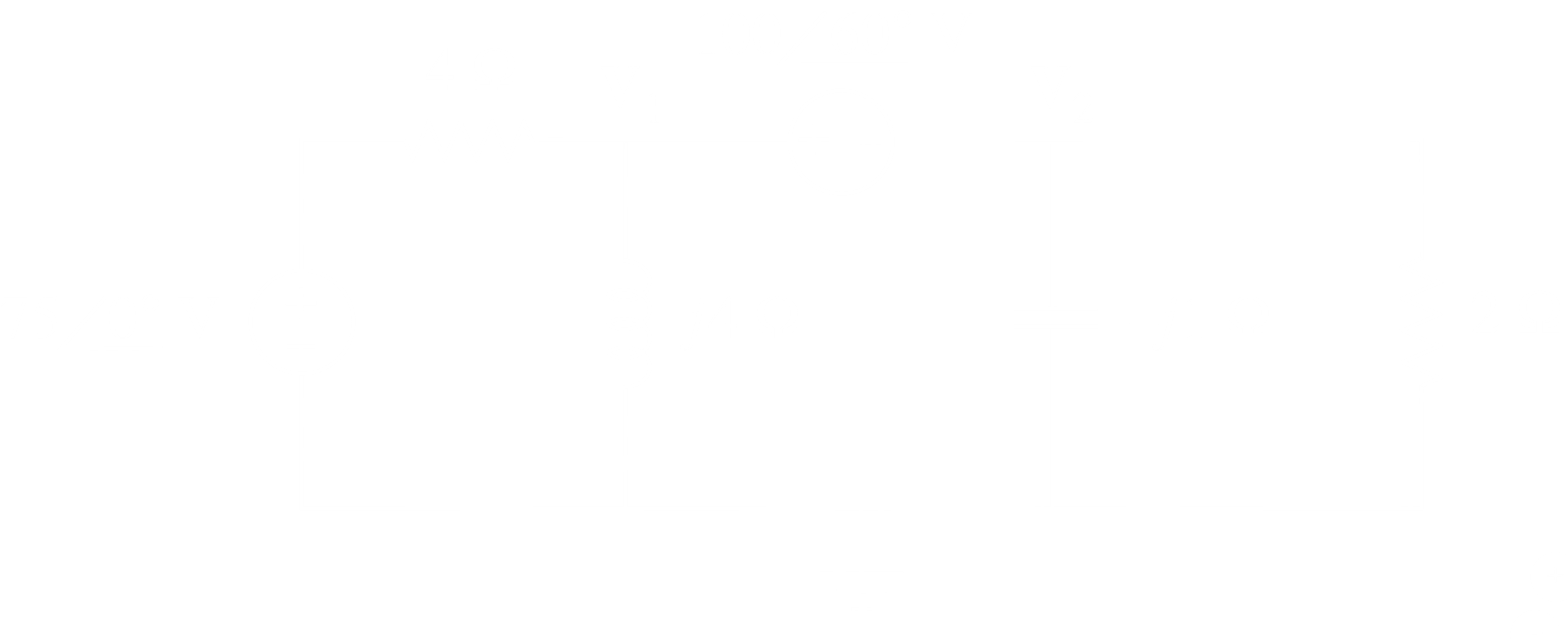


## 10.6 Thevenin’s and Norton’s Theorems

Thevenin’s and Norton’s Theorems are applied in nearly the same way in AC circuits as they were in DC circuits. The only difference is, with dependent sources, the additional source that must be added is said to be of amperes or volts. This is the same as writing or , just in polar form.

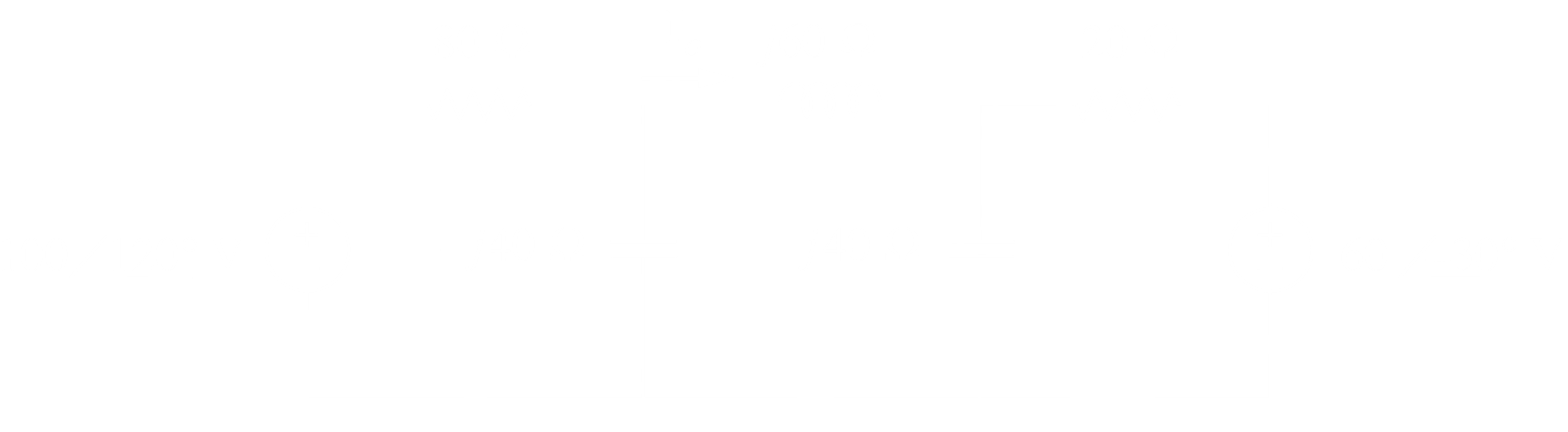
Another important point is that if there are two sources in the circuit, with different frequencies, then two separate Thevenin’s or Norton’s equivalent circuits are found.

Practice Problem 10.2



If no frequency is given at the source, and reactance must be found, assume , thus .

Exercise 10.31



must be used instead of to avoid confusion in AC circuits.

A circuit containing both DC and AC sources can be solved using superposition theorem. When considering the DC circuit, inductors will be short circuited and capacitors will be open circuited. Using Thevenin’s Theorem, we will obtain 2 circuits.

Practice Problem 10.8

