

# The Governing Equations of a Multi Loop Circuit

Bernd Schröder

# Kirchhoff's Laws

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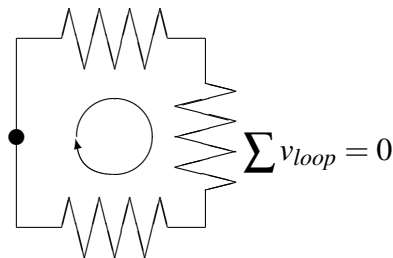
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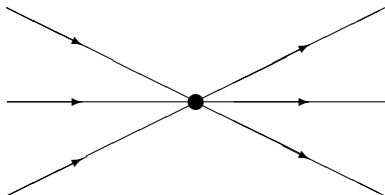


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$$\sum i_{in} = \sum i_{out}$$

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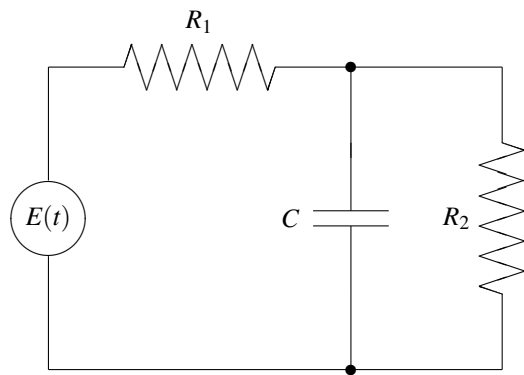
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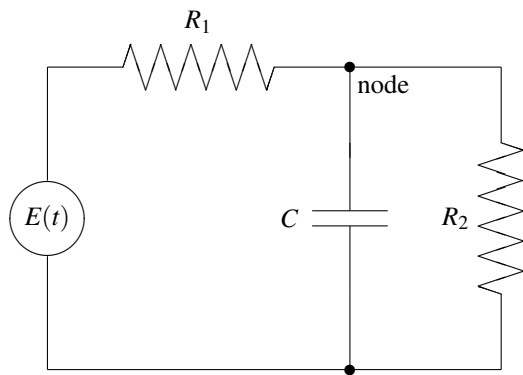
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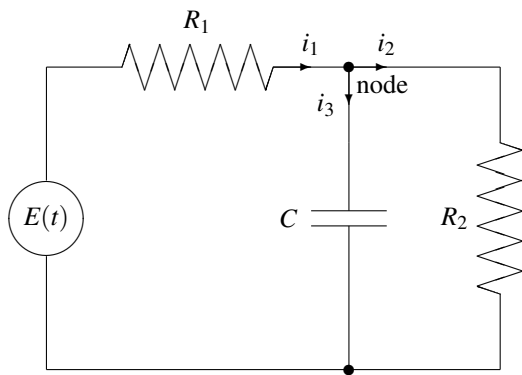
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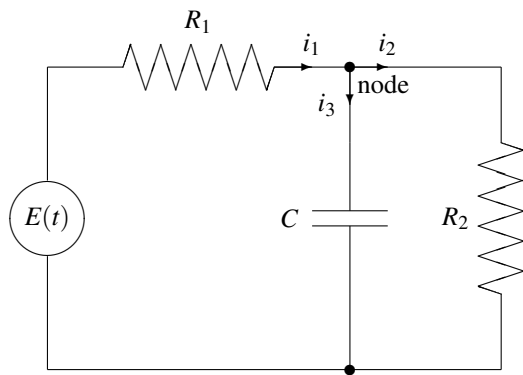
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3. Council's Law (honorable mention). Never become part of the circuit.



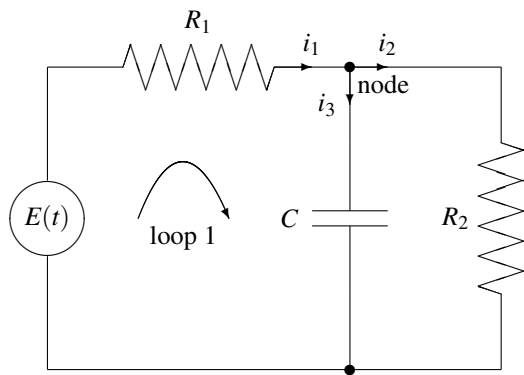




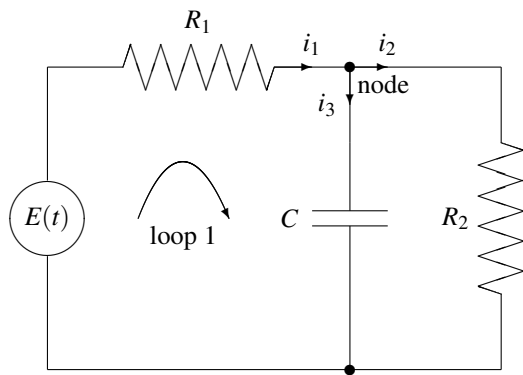




$$i_1 = i_2 + i_3$$

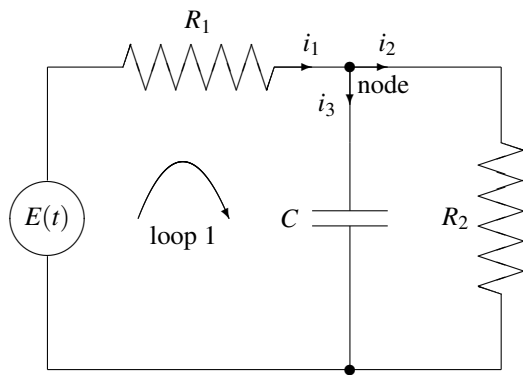


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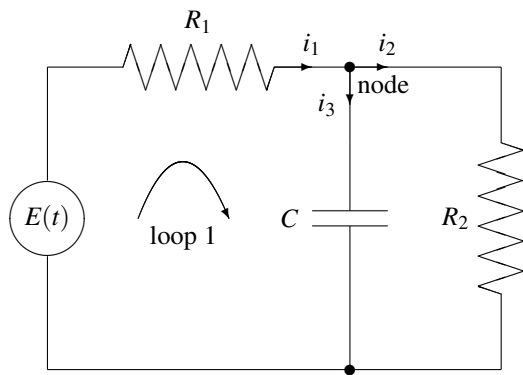
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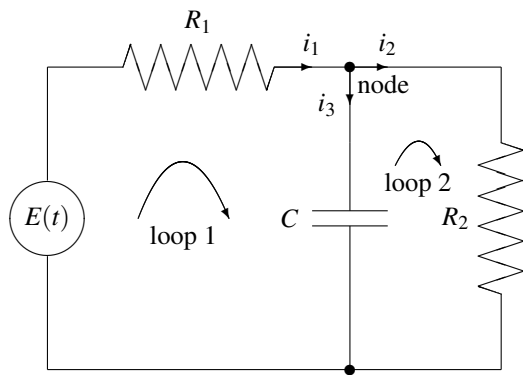
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$$E(t) = R_1 i_1$$



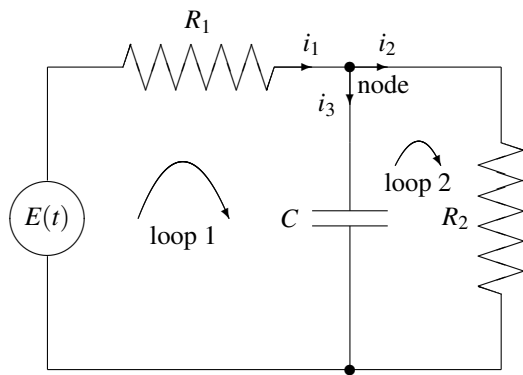
$$i_1 = i_2 + i_3$$

$$E(t) = R_1 i_1 + \frac{1}{C} \int i_3 dt$$



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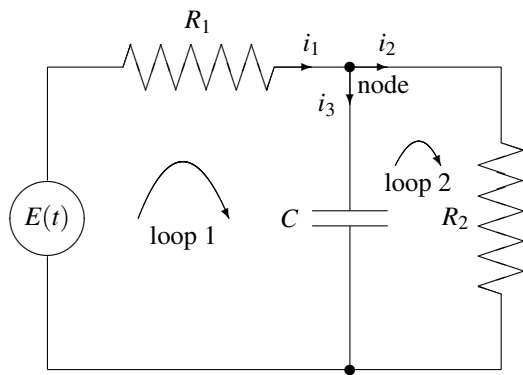
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$$R_2 i_2$$

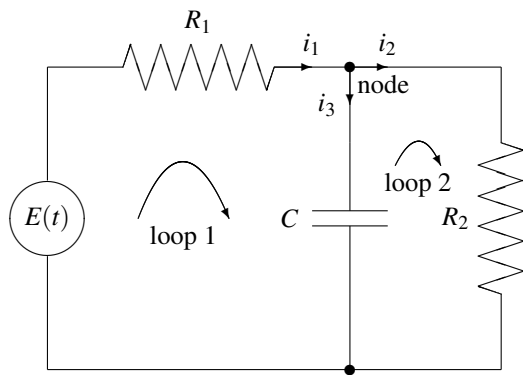


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$$R_2 i_2 - \frac{1}{C} \int i_3 dt$$





$$i_1 = i_2 + i_3$$

$$E(t) = R_1 i_1 + \frac{1}{C} \int i_3 dt$$

$$R_2 i_2 - \frac{1}{C} \int i_3 dt = 0$$