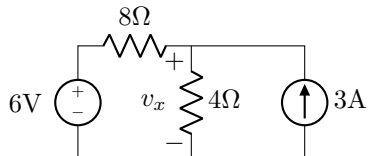


Lecture 17, Feb 18, 2022

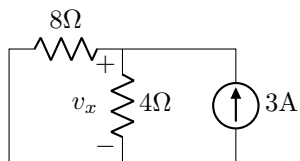
Superposition Principle

- Linear circuit: A circuit that consists of independent sources, linear dependent sources, and linear elements
 - Examples of linear elements include resistors, capacitors and inductors
- Superposition principle: The response of a linear circuit to multiple independent sources is equal to the algebraic sum of the responses caused by each independent source acting alone
 - This allows us to look at only one independent source at a time to simplify the problem
- Example circuit: Find the voltage v_x :



- Phase 1: Deactivate the voltage source

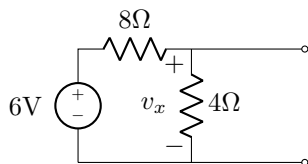
* To deactivate a voltage source, we short it out so the voltage is zero:



* Now the resistors are in parallel; use current division: $i_{x_1} = 3 \frac{8}{4+8} = 2\text{A}$, so $v_{x_1} = 4i_{x_1} = 8\text{V}$

- Phase 2: Deactivate the current source

* To deactivate a current source, we open the circuit so the current is zero:



* Now the resistors are in series; use voltage division: $v_{x_2} = 6 \frac{4}{4+8} = 2\text{V}$

- The voltage across v_x with the two sources combined is $v_x = v_{x_1} + v_{x_2} = 10\text{V}$