# Sign Conventions and Laws

## Ohm's Law

$V = +iR$ (*i* enters V+)

$V = -iR$ (*i* enters V- // *i* leaves V+)

## KVL

$\sum V = 0V$

(+) if *i* enters (+) terminal

(-) if *i* enters (-) terminal

## KCL

$\sum i = 0A$

$i_{entering} = i_{leaving}$ at a node

## Power

$P = +iV$ (*i* enters +)

$P = -iV$ (*i* enters -)

(+) Power = Power Absorbed

(-) Power = Power Delivered

# Nodal Ohm's Law

$i = \frac{V_A - V_B}{R}$ $V_A - V_B$ (Tail – Head)

# Superposition

- Check for Linear
- Keep one source
- Solve for values
- Sum results

## Resistors in Series

- Current is the same across the resistors

Equivalent Resistance

$$R_{eq} = R_1 + R_2 + R_3 + \cdots$$

Voltage Divider

$V_n = +V_s \frac{R_n}{R_{eq}}$ (+ terminals face each other)

$V_n = -V_s \frac{R_n}{R_{eq}}$ (+ and – terminals face each other)

## Resistors in Parallel

- Voltage is the same across all branches

Req

$$R_{eq} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots}$$

For two resistors:

$$R_{eq} = \frac{R_1(R_2)}{R_1 + R_2}$$

Current Divider

$i_n = +i_s \frac{R_{eq}}{R_n}$ (*i* is the same direction)

$i_n = -i_s \frac{R_{eq}}{R_n}$ (*i* is opposite direction)

With two resistors:

$$i_1 = i_s \frac{R_2}{R_1 + R_2}$$

Thevenin/ Norton Equivalents

$$V_T = V_{OC}$$

$$R_T = R_{eq}$$

$$i_N = \frac{V_T}{R_T}$$

With a Dependent Source:

$V_T$ and $i_N$ is the same

$$R_{eq} = \frac{V_T}{R_T}$$