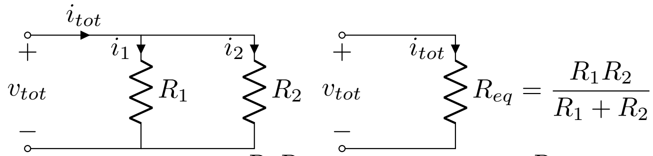
Lecture 11, Feb 4, 2022

Current Division

- Similar rule can be found for current in a parallel circuit:

  - $v_{tot} = R_1 i_1 = \frac{R_1 R_2}{R_1 + R_2} i_{tot} \implies i_1 = \frac{R_2}{R_1 + R_2} i_{tot}$
- The current division principle is the dual of the voltage division principle; note the current division ratio uses the resistances of the **other** branches ($\frac{R_2}{R_1 + R_2}$ for current, $\frac{R_1}{R_1 + R_2}$ for voltage)
- As with voltage division, the signs only work if the direction of i_1 matches the direction of i_{tot}; if the directions don't match, we need an additional negative sign
- We can write this in terms of the conductance as $i_1 = \frac{G_1}{G_1 + G_2} i_{tot}$, similar to the voltage law
- For multiple resistors in series, we can either use the conductances, or collapse the other resistors down to a single resistor; for 3 resistors it becomes $i_1 = \frac{R_2 R_3}{R_1 R_2 + R_2 R_3 + R_1 R_3} i_{tot}$ and so on
- Can also be written as $i_1 = \frac{\frac{1}{R_1}}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}} i_{tot}$