01.8 fun.exe Exercises for Chapter 01 fun

Exercise 01.1 corporationism

a. Let two resistors with resistances 1 kΩ and 2 kΩ be connected in series. What is their combined effective resistance?
b. Let two resistors R_1 and R_2 be connected in series. Prove that their combined effective resistance is greater than that of either resistor, individually. Use KVL, KCL, and Ohm's Law.
c. Let two resistors with resistances 1 kΩ and 2 kΩ be connected in parallel. What is their combined effective resistance?
d. Let any two resistors R_1 and R_2 be connected in parallel. Prove that their combined effective resistance is less than that of either resistor, individually. Use KVL, KCL, and Ohm's Law.

Exercise 01.2 pseudoscarus

Beginning with the definition of electrical power and the elemental equation of an ideal resistor, find

a. an expression for the power dissipated by a resistor in terms of voltage v_R and resistance R, only; and
b. an expression for the power dissipated by a resistor in terms of current i_R and resistance R, only.

Exercise 01.3 banana

An unregulated function generator has a 50 Ω output resistance. The front panel displays a nominal voltage amplitude of 10 V, which assumes a matching load of 50 Ω. However, the output is *not* connected to this nominal matching load. Instead, it is connected to an

oscilloscope with high input resistance—let's say it's infinite. Respond to the following questions and imperatives about this situation.

a. Draw a circuit diagram.
b. Using the given information about the "nominal" voltage amplitude, determine what the ideal source voltage amplitude V_s should be in your circuit diagram/function generator model.
c. Solve for the actual voltage amplitude v_a at the oscilloscope if the front panel says 5 V amplitude.

Exercise 01.4 doorbell

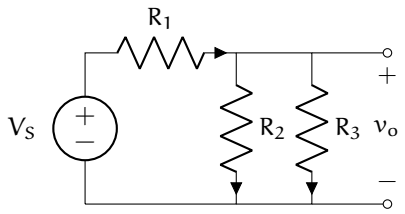
Consider two signals with voltage ratios expressed in decibels as follows. What are the corresponding power and voltage amplitude ratios?[6]

a. 0 dB
b. 3 dB
c. 10 dB
d. 20 dB

6. This exercise was inspired by Horowitz **and** Hill (2015).

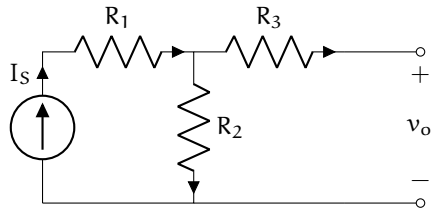
Exercise 01.5 crumble

For the circuit diagram below with voltage source V_S and output voltage v_o, (a) construct a Thévenin equivalent circuit. Be sure to specify the equivalent source V_e and resistance R_e. Let $R_1 = R_2 = 1\ \text{k}\Omega$ and $R_3 = 2\ \text{k}\Omega$. (b) Convert the Thévenin equivalent circuit from (a) to a Norton equivalent.



Exercise 01.6 coracomorph

For the circuit diagram below with current source I_S and output voltage v_o, (a) construct a Norton equivalent circuit. Be sure to specify the equivalent source I_e and resistance R_e. Let $R_1 = R_2 = 1\ \text{k}\Omega$ and $R_3 = 2\ \text{k}\Omega$. (b) Convert the Norton equivalent circuit from (a) to a Thévenin equivalent.



Exercise 01.7 masticurous

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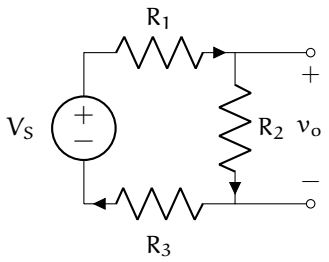
For the circuit diagram below with voltage source V_S and output voltage v_o, (a) construct a Norton equivalent circuit. Be sure to specify the equivalent source I_e and resistance R_e. Let $R_1 = 1\ \text{k}\Omega$, $R_2 = 2\ \text{k}\Omega$, and $R_3 = 3\ \text{k}\Omega$. (b) Convert the Norton equivalent circuit from (a) to a Thévenin equivalent.



02 can

Circuit analysis