EECE 2150 - Circuits and Signals: Biomedical Applications Fall 2018 - Section 3
Quiz 4

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The circuit shown is an inverting amplifier, with $R_1 = 2\,\mathrm{k\Omega}$, $R_2 = 12\,\mathrm{k\Omega}$, $R_3 = 2\,\mathrm{k\Omega}$, $R_L = 10\,\mathrm{k\Omega}$

1. What is the voltage gain of the amplifier?

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2. If we connect an ideal voltage source, $V_{in} = 100\,\mathrm{mV}$, to the input, what is the current from that source. Assume positive current is from left to right in R_1.

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3. How much power is produced by the source?

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4. For the same input, what is the output voltage?

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5. How much power is absorbed by the load?

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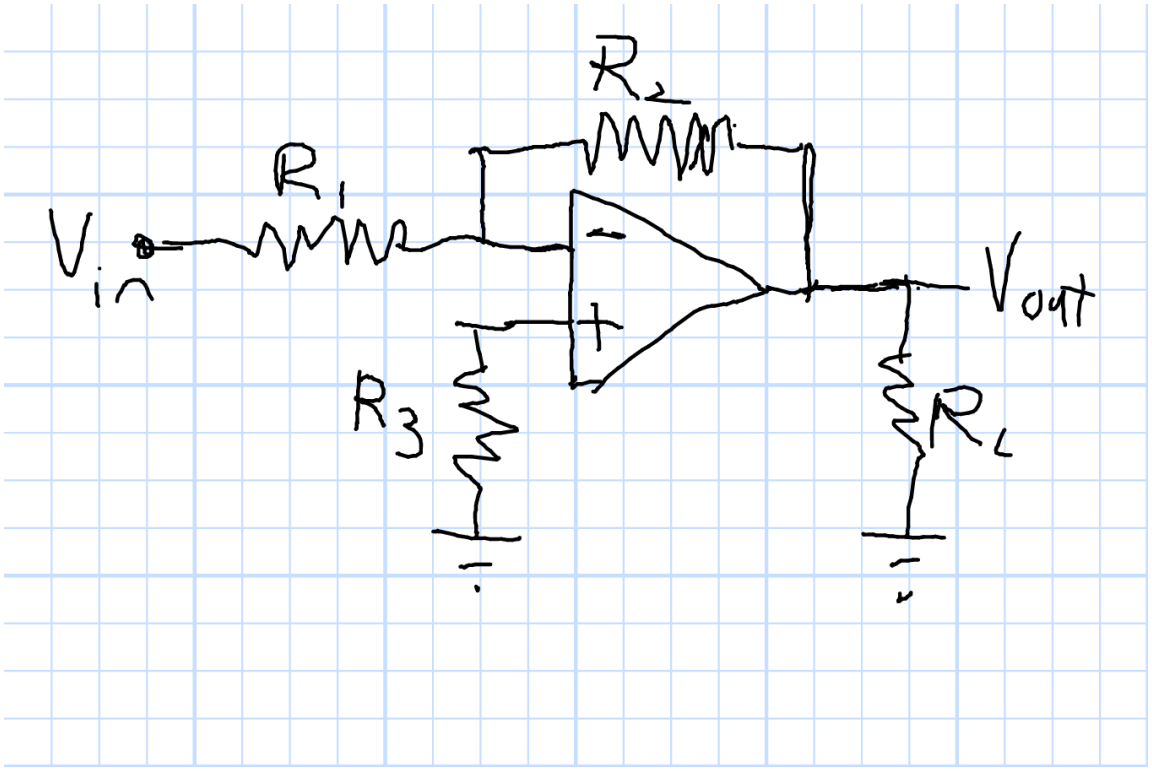
R2
R1
Vin
Vout
R3
RL

1.
$$A_V = -\frac{R_2}{R_1} = -\frac{12\,\mathrm{k\Omega}}{2\,\mathrm{k\Omega}} = -6.$$

2.
$$i = \frac{V_{in} - 0}{R_1} = 100\,\mathrm{mV}2\,\mathrm{k\Omega} = 50\,\mu\mathrm{A}.$$

Note that R_3 doesn't matter. No current flows in it so $V_+ = 0$.

3.
$$P = iV = 50\,\mu\mathrm{A} \times 100\,\mathrm{mV} = 5\,\mu\mathrm{W}.$$

4.
$$V_{out} = A_V V_{in} = -6 \times 100\,\mathrm{mV} = -600\,\mathrm{mV}.$$

5.
$$P = \frac{V^2}{R_L} = \frac{(-600\,\mathrm{mV})^2}{10\,\mathrm{k\Omega}} = 36\,\mu\mathrm{W}.$$