EECE 2150 - Circuits and Signals: Biomedical Applications Fall 2022
Quiz 7

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Student Name: _____

The ampifier circuit in the figure is intended to take the derivative of the input voltage, v_{in}. The capacitor $C = 1\,\mu\text{F}$, $R_1 \approx 0$, and $R_2 = 2\,\text{k}\Omega$. The amplifier has power supply rails at $\pm 12\,\text{V}$.

1. Write the current, $i_1(t)$ as a function of $v_{in}(t)$.

   _____ .

2. What is the current, i_2 as a function of $v_{in}(t)$.

   _____ .
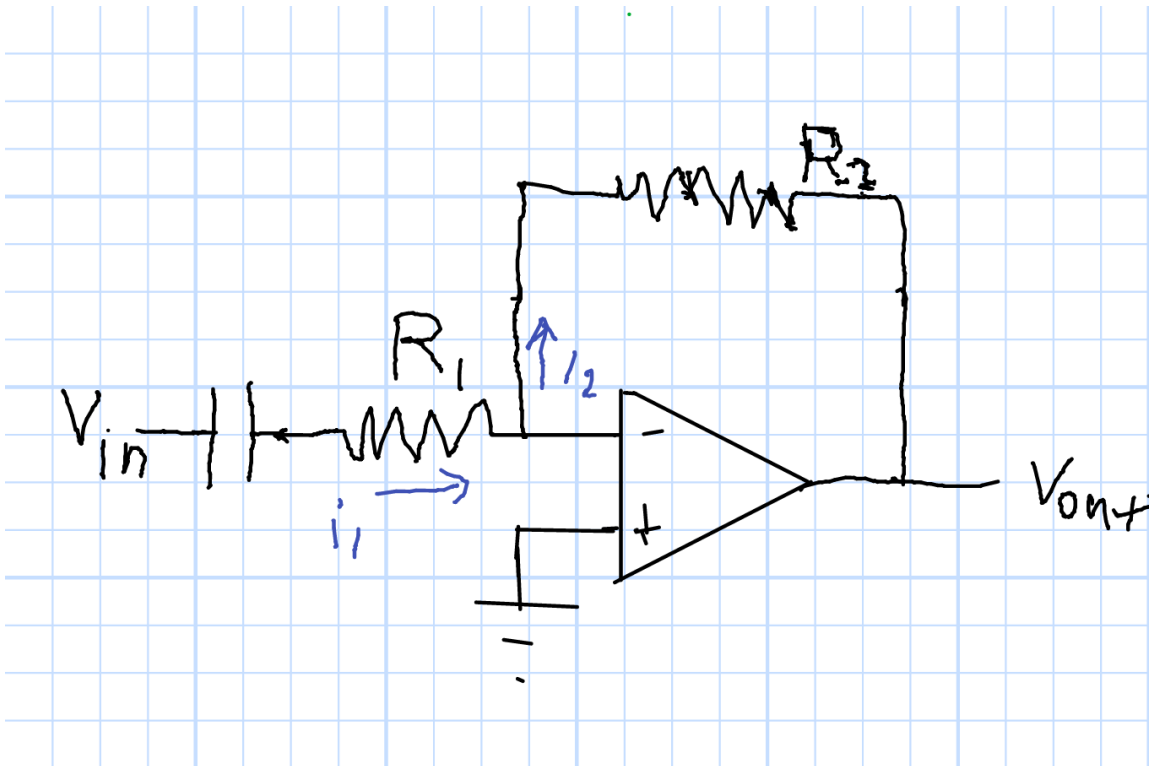

3. What is v_{out} as a function of $v_{in}(t)$.

   _____ .

4. What is the "gain?" Be careful here, because by "gain" I mean the ratio of v_{out} to $\frac{dv_{in}}{dt}$. This gain has units. Be sure to include them in the answer.

   _____ .

5. If the input is a pulse such that $v_{in} = 1\,\text{V}$ for $0 < t < 5\,\mu\text{s}$, and zero for all other times, sketch the output.

1. $i_1 = C \frac{dv_1}{dt}$

2. $i_2 = C \frac{dv_1}{dt}$

3. $v_{out} = -R_2 C \frac{dv_1}{dt} = -2 \times 10^{-3}$ sec

4. Negative 12 volt spike at $t = 0$ and positive at $t = 5\,\mu$s.