The circuit above is exposed to an input voltage $V_i$ as shown. Sketch the output, $V_o$. At what times does $V_o = 231$ mV?

(Resistances in kΩ. Voltages in V. Current in mA)

Output is a falling exponential

Time constant: $\tau = 71.5$ ms

At time $\Delta t$ after $t = 115$.

\[
\frac{231}{349} = \exp\left(-\frac{\Delta t}{\tau}\right)
\]

\[
\Delta t = -\tau \log\left(\frac{231}{349}\right)
\]

\[
t = 115 + 29.5 = 144.5 \text{ ms}
\]
$V_i$ is a sinusoidal waveform with frequency $\omega = 2\pi f$.

- Calculate a (simplified) expression for $H(\omega) = \frac{V_o}{V_i}$
- What is $H(\omega)$ when $\omega \rightarrow 0$ (very low frequency)?
- What is $H(\omega)$ when $\omega \rightarrow \infty$ (HF)?

- Calculate a (simplified) expression for $H(\omega) = \frac{V_o}{V_i}$

\[
H(\omega) = \frac{2.2 + \frac{1}{j\omega32.5}}{3.2 + \frac{1}{j\omega42.5} + 2.2 + \frac{1}{j\omega32.5}}
\]

\[
H(\omega) = \frac{2.2 + 0.0308}{5.4 + 0.0543}
\]

\[
H(\omega) = 0.4074\frac{1 + \frac{1}{j\omega14.76}}{1 + \frac{1}{j\omega3.41}}
\]

- What is $H(\omega)$ when $\omega = 0$ (DC)? Answer = 0.4074
- What is $H(\omega)$ when $\omega \rightarrow \infty$ (HF)? Answer = 0.09
In the circuit above, $V_1$ is 6.4 V, and $V_2$ is 5.5 V.

- What is the value of $V_o$?
- How much current flows out of $V_1$?

(Resistances in kΩ. Voltages in V. Current in mA)

Loop 1:
- $6.4 - i_11.2 + 5.5 - (i_1 + i_2)2.2 = 0.$
- $11.9 = i_13.4 + i_22.2$
- $i_1 = \frac{11.9 - i_22.2}{3.4} = 3.50 - i_20.65$

Loop 2:
- $5.5 - (i_1 + i_2)2.2 - i_256.3 - i_242.5 = 0.$
- $5.5 = i_12.2 + i_2101$
- $5.5 = 7.70 - i_21.43 + i_2101.00 = 7.70 + i_299.57$
- $-2.20 = i_299.57$
- $i_2 = -0.0221$
- $V_o = -i_256.3 = 1.24423$ (What is the value of $V_o$?)
- $i_1 = 3.50 - i_20.65 = 3.514365$
- $i_1 + i_2 = 3.492265$ (How much current flows out of $V_1$?)