The circuit above is exposed to the an input voltage $V_i$ as shown. Sketch the output, $V_o$. At what times does $V_o = 335$ mV?

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

Output is a falling exponential

Time constant: $\tau = 72.4$ ms

At time $\Delta t$ after $t = 70$.

$$335 = 611 \exp(-\Delta t/\tau)$$

$$\frac{335}{611} = \exp(-\Delta t/\tau)$$

$$\Delta t = -\tau \log \left(\frac{335}{611}\right)$$

$$t = 70 + 43.5 = 113.5 \text{ ms}$$
$V_i$ 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)?

\[
H(\omega) = \frac{2.0 + \frac{1}{j\omega36.2}}{2.5 + \frac{1}{j\omega55.6} + 2.0 + \frac{1}{j\omega36.2}}
\]

\[
H(\omega) = \frac{2.0 + \frac{0.0276}{j\omega}}{4.5 + \frac{0.0456}{j\omega}}
\]

\[
H(\omega) = 0.4444 \frac{1 + \frac{1}{j\omega18.12}}{1 + \frac{1}{j\omega4.87}}
\]

- What is $H(\omega)$ when $\omega = 0$ (DC)? Answer = 0.4444
- What is $H(\omega)$ when $\omega \rightarrow \infty$ (HF)? Answer = 0.12
In the circuit above, $V_1$ is 6.2 V, and $V_2$ is 2.4 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:
- $6.2 - i_1 1.6 + 2.4 - (i_1 + i_2) 2.0 = 0$.
- $8.6 = i_1 3.6 + i_2 2.0$
- $i_1 = \frac{8.6 - i_2 2.0}{3.6} = 2.39 - i_2 0.56$

Loop 2:
- $2.4 - (i_1 + i_2) 2.0 - i_2 45.1 - i_2 55.6 = 0$.
- $2.4 = i_1 2.0 + i_2 102.7$
- $2.4 = 4.78 - i_2 1.12 + i_2 102.70 = 4.78 + i_2 101.58$
- $-2.38 = i_2 101.58$
- $i_2 = -0.0234$
- $V_o = -i_2 45.1 = 1.05534$ (What is the value of $V_o$?)
- $i_1 = 2.39 - i_2 0.56 = 2.403104$
- $i_1 + i_2 = 2.379704$ (How much current flows out of $V_1$?)