The circuit above is exposed to the input voltage $V_i$ as shown. Sketch the output, $V_o$. At what times does $V_o = 403 \text{ mV}$?

- Resistances in kΩ. Voltages in V. Current in mA.
- Output is a falling exponential.
- Time constant: $\tau = 119.6 \text{ ms}$
- At time $\Delta t$ after $t = 100$. 

$$\frac{403}{627} = \exp(-\frac{\Delta t}{\tau})$$

$$\Delta t = -\tau \log\left(\frac{403}{627}\right)$$

$$t = 100 + 52.9 = 152.9 \text{ ms}$$
$V_i$ 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 $\omega \to 0$ (very low frequency)?
- What is $H(\omega)$ when $\omega \to \infty$ (HF)?

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

$$H(\omega) = \frac{2.6 + \frac{1}{j\omega 46.0}}{3.1 + \frac{1}{j\omega 56.3} + 2.6 + \frac{1}{j\omega 46.0}}$$

$$H(\omega) = \frac{2.6 + 0.0217}{5.7 + 0.0895}$$

$$H(\omega) = 0.4561 \frac{1 + \frac{1}{j\omega 17.72}}{1 + \frac{1}{j\omega 4.44}}$$

- What is $H(\omega)$ when $\omega = 0$ (DC)? Answer = 0.4561
- What is $H(\omega)$ when $\omega \to \infty$ (HF)? Answer = 0.11
In the circuit above, $V_1$ is 3.6 V, and $V_2$ is 5.2 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:
- $3.6 - i_1 2.6 + 5.2 - (i_1 + i_2) 2.6 = 0$.
- $8.8 = i_1 5.2 + i_2 2.6$
- $i_1 = \frac{8.8 - i_2 2.6}{5.2} = 1.69 - i_2 0.50$

Loop 2:
- $5.2 - (i_1 + i_2) 2.6 - i_2 52.6 - i_2 56.3 = 0$.
- $5.2 = i_1 2.6 + i_2 111.5$
- $5.2 = 4.39 - i_2 1.30 + i_2 111.50 = 4.39 + i_2 110.20$
- $0.81 = i_2 110.20$
- $i_2 = 0.0074$
- $V_o = -i_2 52.6 = -0.38924$ (What is the value of $V_o$?)
- $i_1 = 1.69 - i_2 0.50 = 1.6863$
- $i_1 + i_2 = 1.6937$ (How much current flows out of $V_1$?)