The circuit above is exposed to the input voltage $V_i$ as shown. Sketch the output, $V_o$. At what times does $V_o = 371$ mV?

(Resistances in k$\Omega$. Voltages in V. Current in mA)

Output is a falling exponential

Time constant: $\tau = 135.4$ ms

At time $\Delta t$ after $t = 35$.

$371 = 659 \exp(-\Delta t/\tau)$

$\frac{371}{659} = \exp(-\Delta t/\tau)$

$\Delta t = -\tau \log\left(\frac{371}{659}\right)$

$t = 35 + 77.8 = 112.8$ 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 $H(\omega) = \frac{V_o}{V_i}$

$H(\omega) = \frac{2.9 + \frac{1}{j\omega46.7}}{2.6 + \frac{1}{j\omega57.9} + 2.9 + \frac{1}{j\omega46.7}}$

$H(\omega) = \frac{2.9 + 0.0214}{5.5 + 0.0877}$

$H(\omega) = 0.5273 \frac{1 + \frac{1}{j\omega16.11}}{1 + \frac{1}{j\omega4.76}}$

- What is $H(\omega)$ when $\omega = 0$ (DC)? Answer = 0.5273
- What is $H(\omega)$ when $\omega \to \infty$ (HF)? Answer = 0.15
In the circuit above, $V_1$ is 6.1 V, and $V_2$ is 6.1 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:
- $6.1 - i_1 2.7 + 6.1 - (i_1 + i_2)2.9 = 0$.
- $12.2 = i_1 5.6 + i_2 2.9$
- $i_1 = \frac{12.2 - i_2 2.9}{5.6} = 2.18 - i_2 0.52$

Loop 2:
- $6.1 - (i_1 + i_2)2.9 - i_2 36.4 - i_2 57.9 = 0$.
- $6.1 = i_1 2.9 + i_2 97.2$
- $6.1 = 6.32 - i_2 1.51 + i_2 97.20 = 6.32 + i_2 95.69$
- $-0.22 = i_2 95.69$
- $i_2 = -0.0023$
- $V_o = -i_2 36.4 = 0.08372$ (What is the value of $V_o$?)
- $i_1 = 2.18 - i_2 0.52 = 2.181196$
- $i_1 + i_2 = 2.178896$ (How much current flows out of $V_1$?)