The circuit above is exposed to the an input voltage $V_i$ as shown. Sketch the output, $V_o$. At what times does $V_o = 468$ mV?

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

Output is a falling exponential

Time constant: $\tau = 135.3$ ms

At time $\Delta t$ after $t = 56$.

$\frac{468}{642} = \exp(-\Delta t/\tau)$

$\Delta t = -\tau \log\left(\frac{468}{642}\right)$

$t = 56 + 42.8 = 98.8$ 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 $H(\omega) = \frac{V_o}{V_i}$

\[
H(\omega) = \frac{3.4 + \frac{1}{j\omega 39.8}}{3.6 + \frac{1}{j\omega 57.1} + 3.4 + \frac{1}{j\omega 39.8}}
\]

\[
H(\omega) = \frac{3.4 + 0.0251}{7 + 0.0426} + \frac{1}{j\omega 11.72}
\]

\[
H(\omega) = 0.4857 + \frac{1}{j\omega 3.35}
\]

- What is $H(\omega)$ when $\omega = 0$ (DC)? Answer = 0.4857
- What is $H(\omega)$ when $\omega \to \infty$ (HF)? Answer = 0.14
In the circuit above, $V_1$ is 2.2 V, and $V_2$ is 1.4 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:
- $2.2 - i_1 2.0 + 1.4 - (i_1 + i_2) 3.4 = 0$.
- $3.6 = i_1 5.4 + i_2 3.4$
- $i_1 = \frac{3.6 - i_2 3.4}{5.4} = 0.67 - i_2 0.63$

Loop 2:
- $1.4 - (i_1 + i_2) 3.4 - i_2 41.4 - i_2 57.1 = 0$.
- $1.4 = i_1 3.4 + i_2 101.9$
- $1.4 = 2.28 - i_2 2.14 + i_2 101.90 = 2.28 + i_2 99.76$
- $-0.88 = i_2 99.76$
- $i_2 = -0.0088$
- $V_o = -i_2 41.4 = 0.36432$ (What is the value of $V_o$? )
- $i_1 = 0.67 - i_2 0.63 = 0.675544$
- $i_1 + i_2 = 0.666744$ ( How much current flows out of $V_1$? )