2025 Q1 Week 1.8 Online Course

* Required

* This form will record your name, please fill your name.

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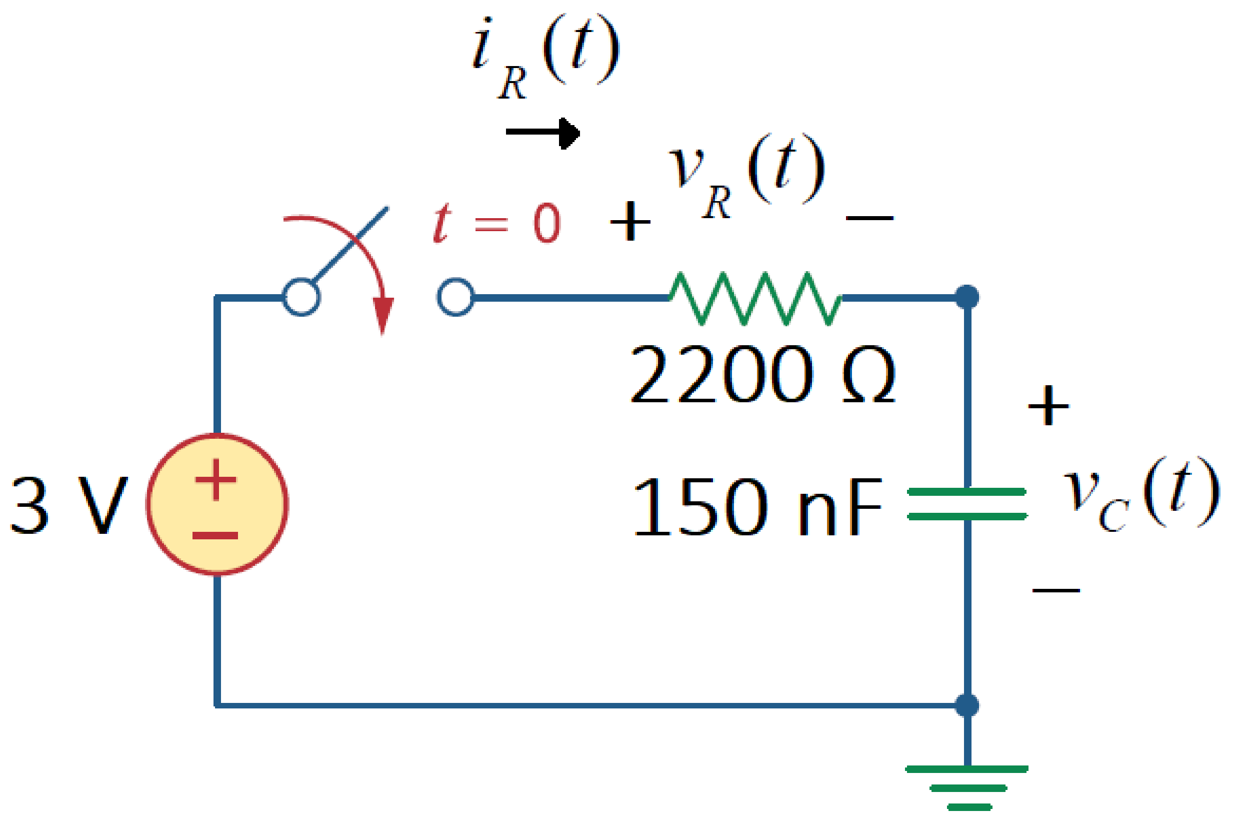
Consider the RC circuit below. Assume that the switch was open for a long time (in steady-state) and the voltage across the capacitor is zero (before 0 s). At t=0 s, the switch is closed.



1

What is the value of the circuit's time constant (T1)? *

- ◯ T1=0.33 s
- ⊗ T1=0.33 ms
- ◯ T1=0.033 ms
- ◯ T1=0.0303 s
- ◯ T1=0.0303 ms
- ◯ T1=330 s

Rth * C=2200 * 150*10^-9 =

2

What is the voltage across the capacitor (v_C(t)) after t=0 s? (note: T1 is the RC circuit's time constant which you obtained in the previous question.) *

- ◯ v_C(t)=3+3exp(-t/T1)
- ⊗ v_C(t)=3-3exp(-t/T1)
- ◯ v_C(t)=-3+3exp(-t/T1)
- ◯ v_C(t)=-3-3exp(-t/T1)
- ◯ v_C(t)=-3exp(-t/T1)
- ◯ v_C(t)=3exp(-t/T1)

v(0-)=v(0+)=0

3

What is the voltage across the resistor (v_R(t)) after t=0 s? *

- ◯ v_R(t)=3+3exp(-t/T1)
- ◯ v_R(t)=3-3exp(-t/T1)
- ◯ v_R(t)=-3+3exp(-t/T1)
- ◯ v_R(t)=-3-3exp(-t/T1)
- ◯ v_R(t)=-3exp(-t/T1)
- ⊗ v_R(t)=3exp(-t/T1)

t=infinity -> v=0

4

What is the current of the resistor (i_R(t)) after t=0 s? *

- ◯ i_R(t)=(1/2200)(3+3exp(-t/T1))
- ◯ i_R(t)=(1/2200)(3-3exp(-t/T1))
- ◯ i_R(t)=(1/2200)(-3+3exp(-t/T1))
- ◯ i_R(t)=(1/2200)(-3-3exp(-t/T1))
- ◯ i_R(t)=(1/2200)(-3exp(-t/T1))
- ⊗ i_R(t)=(1/2200)(3exp(-t/T1))
- ◯ i_R(t)=0 A
- ◯ i_R(t)=3/2200 A

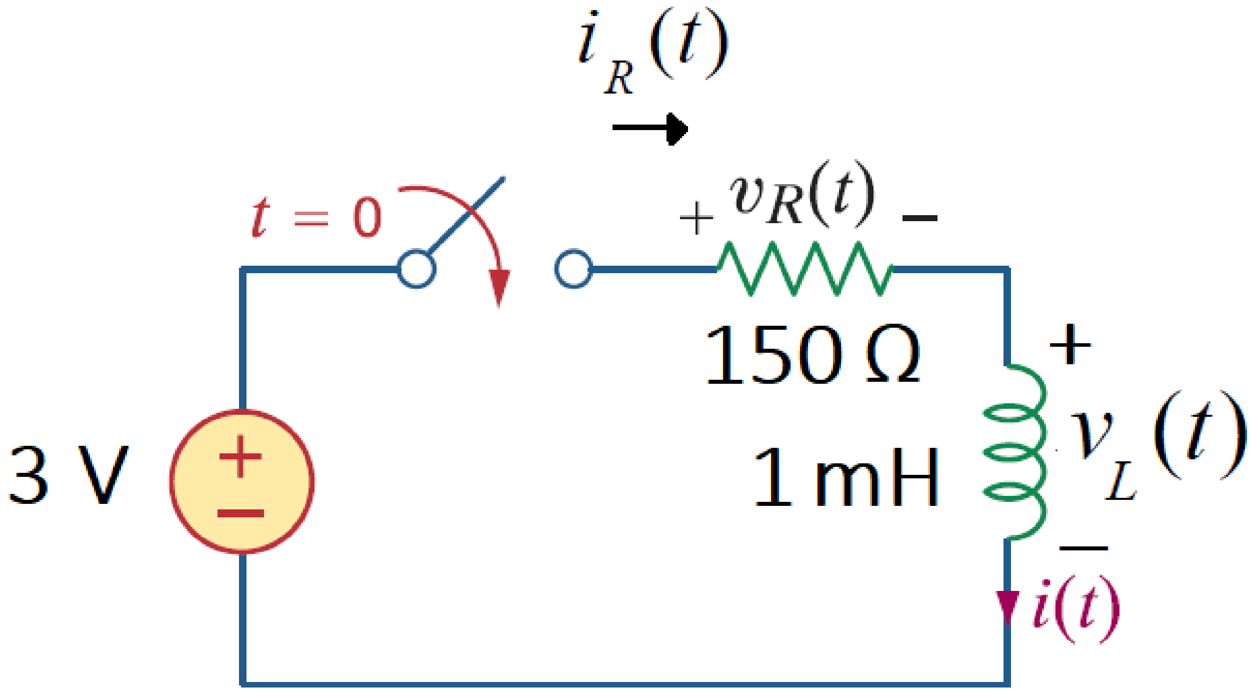
i=v/R

5

In the past questions, you solved the RC circuit where the input voltage was 3 V at t=0 s and the initial voltage of the capacitor (t=0 s) was 0 V. For this question, solve it again where the input voltage is +1.5 V at t=0 s and the initial voltage of the capacitor (t=0 s) is equal to -1.5 V. What is the voltage across the capacitor (v_C(t)) after t=0 s? (note: T1 is the RC circuit's time constant which you obtained in the previous question.) *

- ◯ v_C(t)=1.5+3exp(-t/T1)
- ⊗ v_C(t)=1.5-3exp(-t/T1)
- ◯ v_C(t)=-1.5+3exp(-t/T1)
- ◯ v_C(t)=-1.5-3exp(-t/T1)
- ◯ v_C(t)=-1.5exp(-t/T1)
- ◯ v_C(t)=1.5exp(-t/T1)

Consider the RL circuit below. Assume that the switch was open for a long time (in steady-state). At t=0 s, the switch is closed.



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What is the value of the RL circuit's time constant (T2)? *

- ◯ T2=0.0067 s
- X T2=0.0067 ms
- ◯ T2=670 s
- ◯ T2=0.15 s
- ◯ T2=0.15 ms

T2=L/Rth=0.001/150=

7

What is the voltage across the inductor (v_L(t)) after t=0 s? (note: T2 is the RL circuit's time constant which you obtained in the previous question) *

- ○ v_c(t)=3+3exp(-t/T2)
- ○ v_c(t)=3-3exp(-t/T2)
- ○ v_c(t)=-3+3exp(-t/T2)
- ○ v_c(t)=-3-3exp(-t/T2)
- ○ v_c(t)=-3exp(-t/T2)
- X v_c(t)=3exp(-t/T2)

8

What is the voltage across the resistor (v_R(t)) after t=0 s? *

- ○ v_R(t)=3+3exp(-t/T2)
- X v_R(t)=3-3exp(-t/T2)
- ○ v_R(t)=-3+3exp(-t/T2)
- ○ v_R(t)=-3-3exp(-t/T2)
- ○ v_R(t)=-3exp(-t/T2)
- ○ v_R(t)=3exp(-t/T2)

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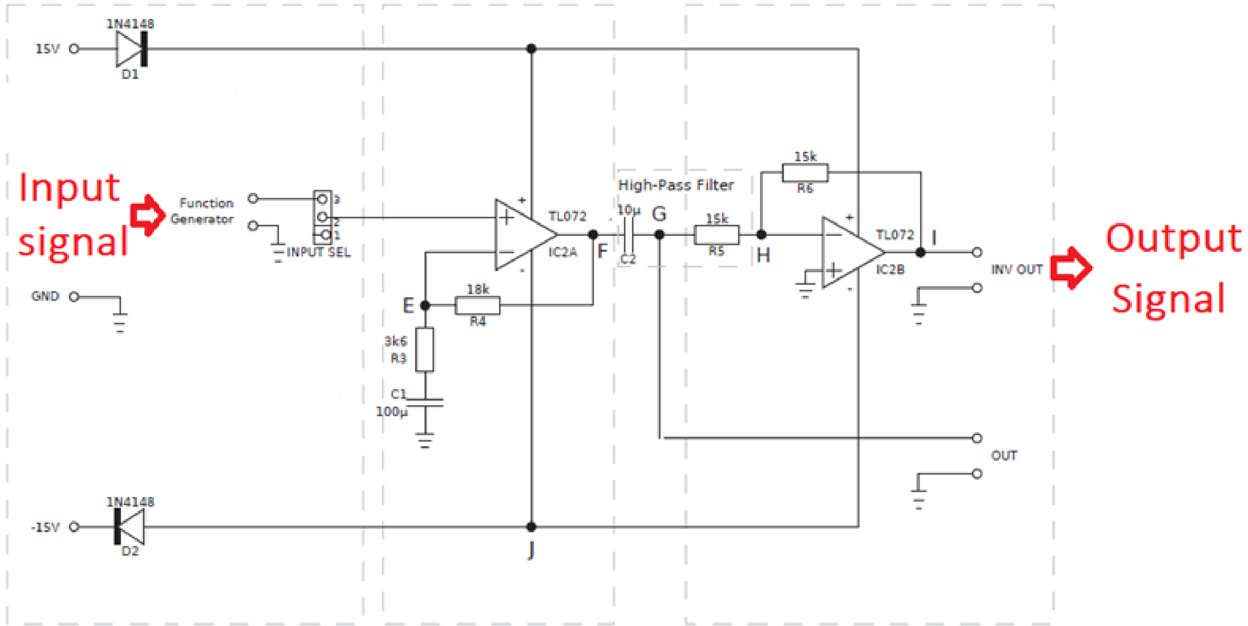
What is the current of the resistor (i_R(t)) after t=0 s? *

- ○ i_R(t)=(1/150)(3+3exp(-t/T2))
- ⊗ i_R(t)=(1/150)(3-3exp(-t/T2))
- ○ i_R(t)=(1/150)(-3+3exp(-t/T2))
- ○ i_R(t)=(1/150)(-3-3exp(-t/T2))
- ○ i_R(t)=(1/150)(-3exp(-t/T2))
- ○ i_R(t)=(1/150)(3exp(-t/T2))
- ○ i_R(t)=0 A
- ○ i_R(t)=3/150 A

i=v/r

Microphone amplifier's circuit

Attention: On Thursday in the lab, you will need the microphone amplifier's circuit which you built two weeks ago. Make sure that you have your microphone amplifier board (from two weeks ago) on Thursday in the lab!



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In week 1.6, you built and tested the microphone amplifier's circuit. What (approximately) were/are the values of the gain (amplification factor) for the non-inverting opamp (A_ni) as well as the gain for the inverting opamp (A_i)? *

- X $A_{ni}=6$, $A_i=-1$
- $A_{ni}=-6$, $A_i=-1$
- $A_{ni}=6$, $A_i=1$
- $A_{ni}=-6$, $A_i=1$
- $A_{ni}=1$, $A_i=-6$
- $A_{ni}=1/6$, $A_i=-1$

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What was/is the value of the overall gain (amplification factor) (A) for the entire circuit? (at the output of the inverting opamp) *

- ○ A=1
- ○ A=-1
- ○ A=6
- ⊗ A=-6
- ○ A=1/6
- ○ A=-1/6