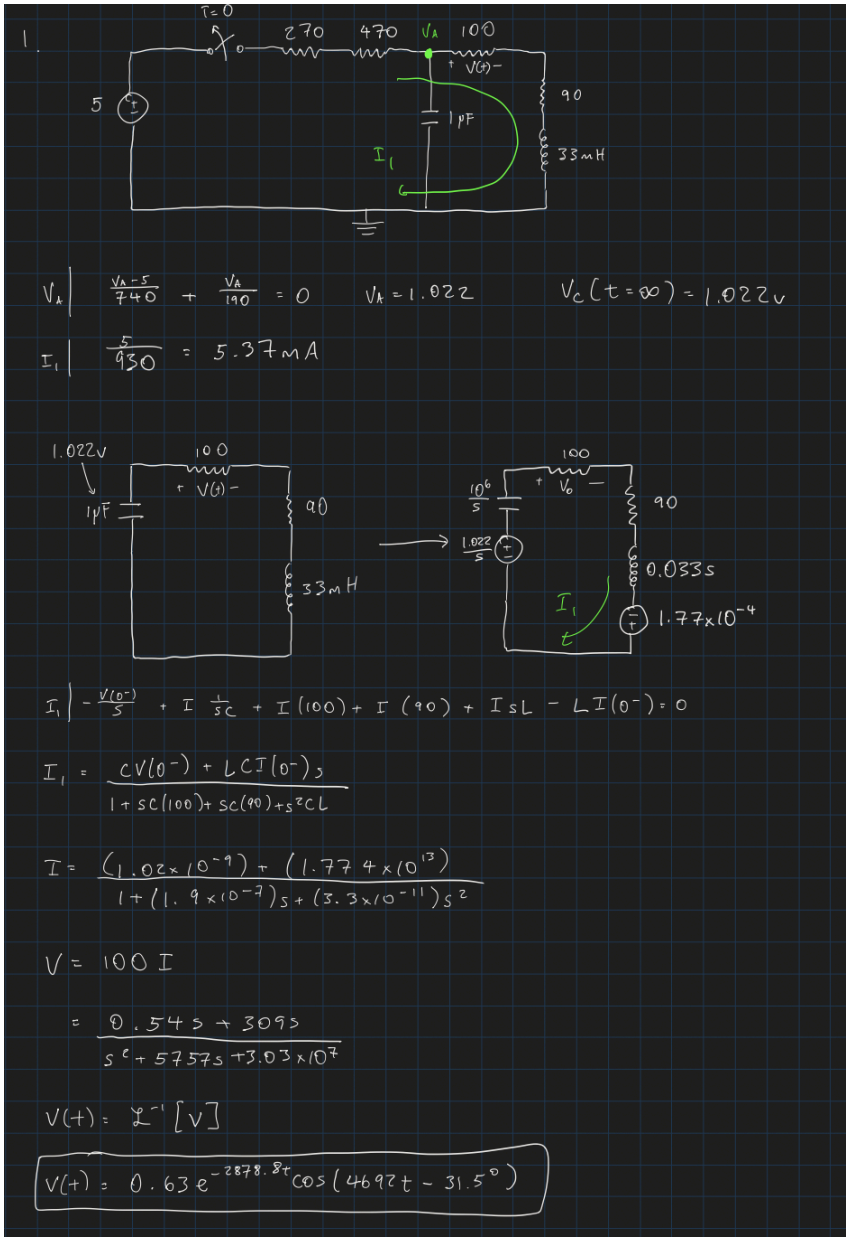
Justin Hsu

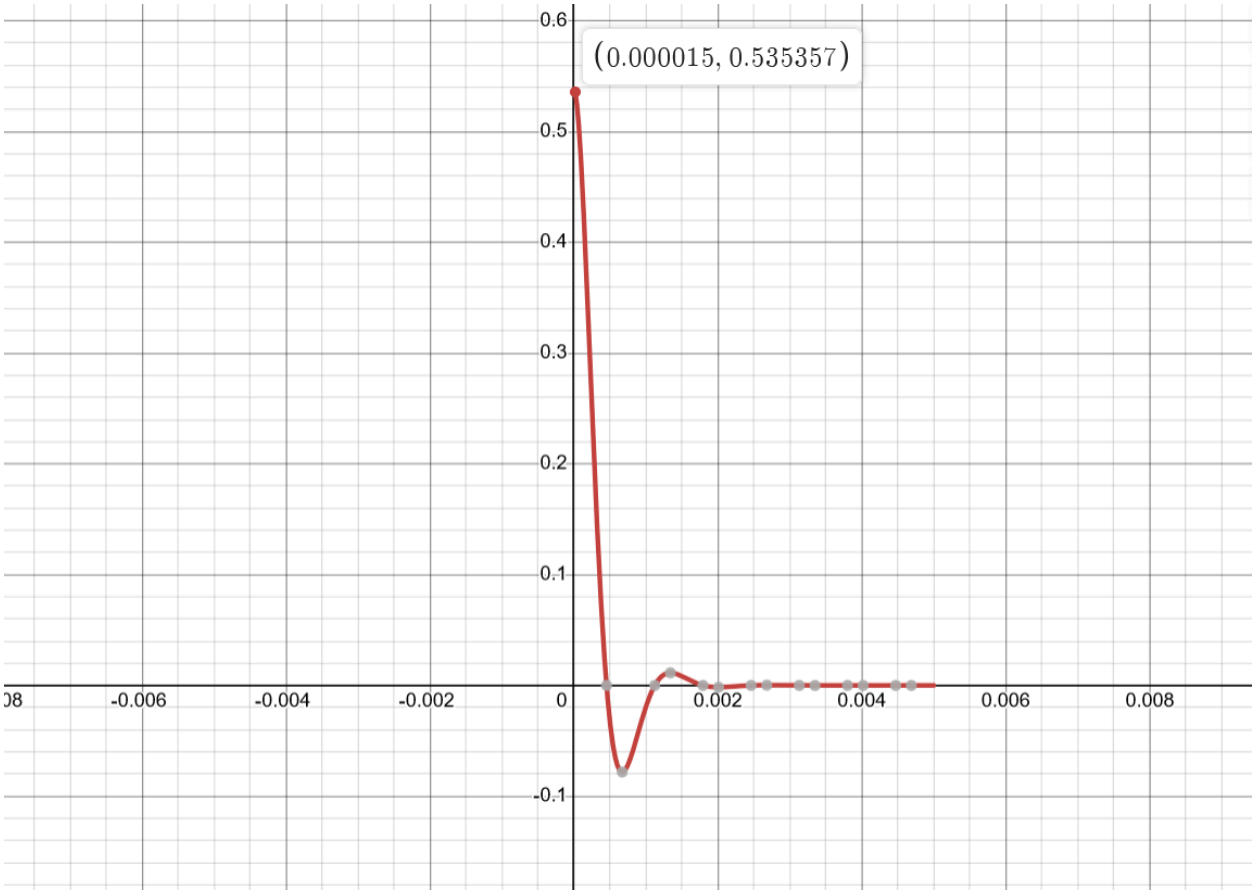
EEC 100 Lab 8

11/27/24

(1) Objective: Learn how to use laplace transforms to deal with constantly changing circuit elements such as an inductor and capacitor without having to solve differential equations.

(2) Prelab:





3.

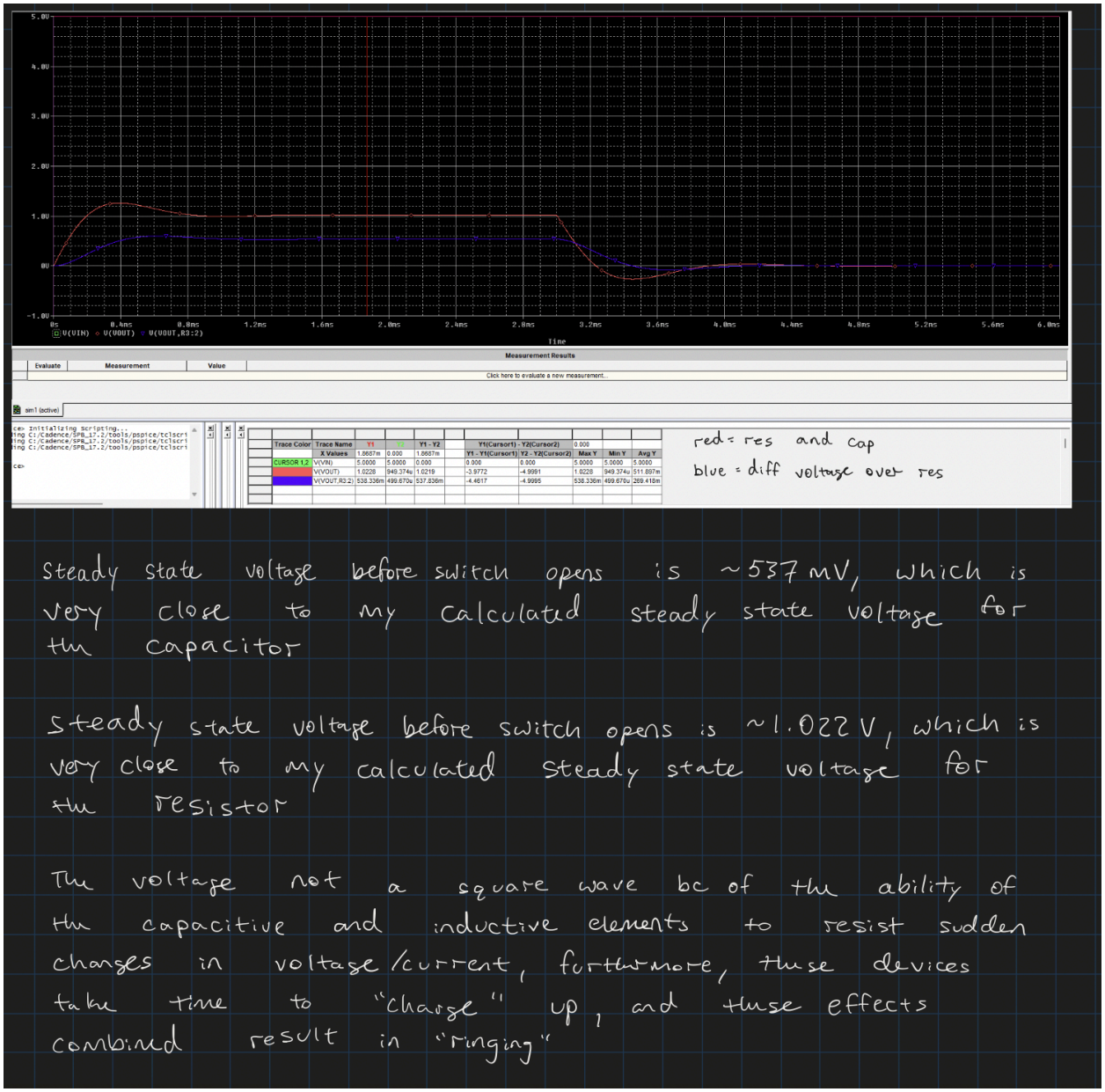
$V(t)_i = 0.53V$

$V(t=\infty) = 0_V$

$V(t)_{min} = -0.08V$

$T = 0.00067$ to reach min

(3) Simulation:

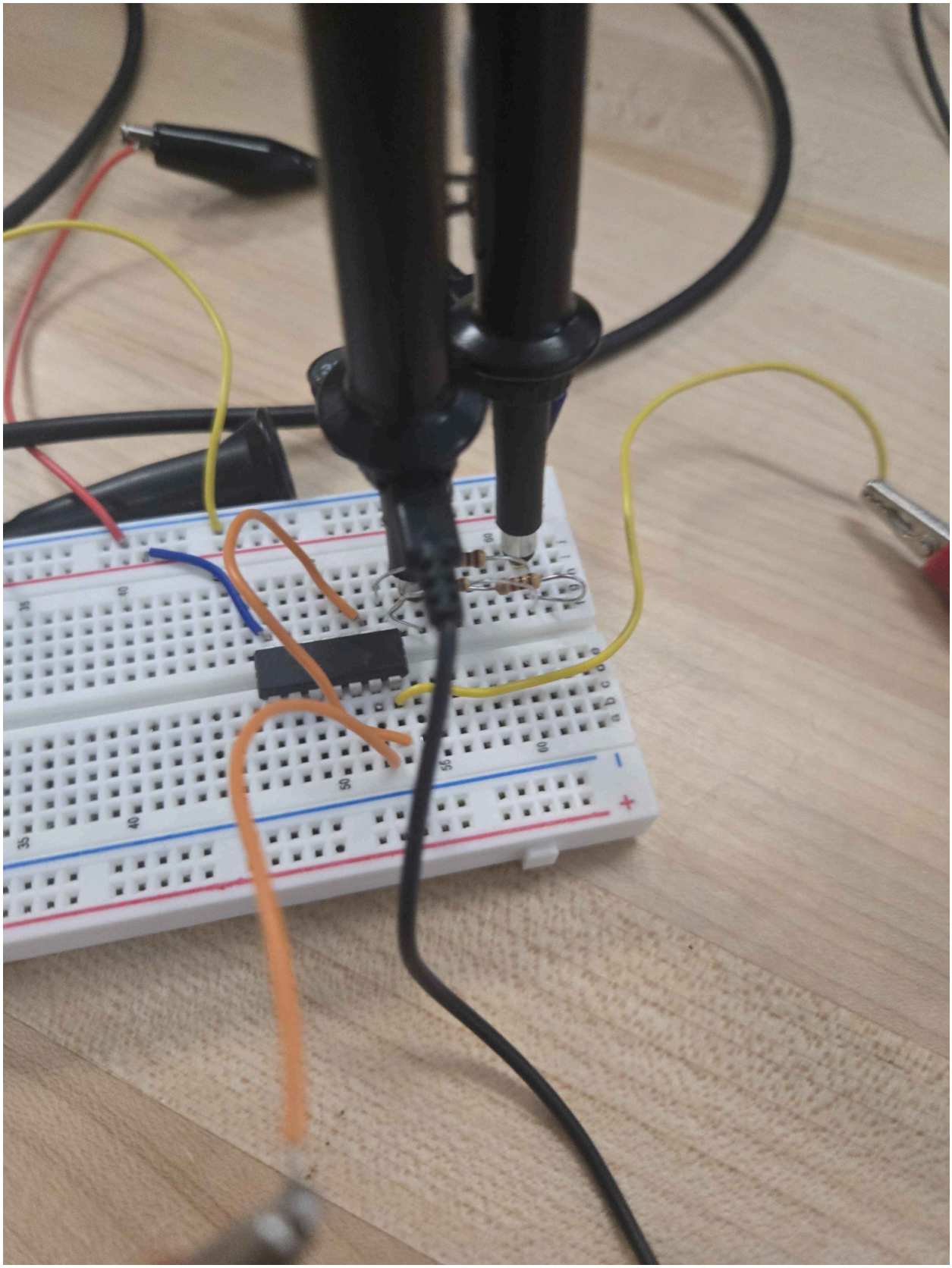


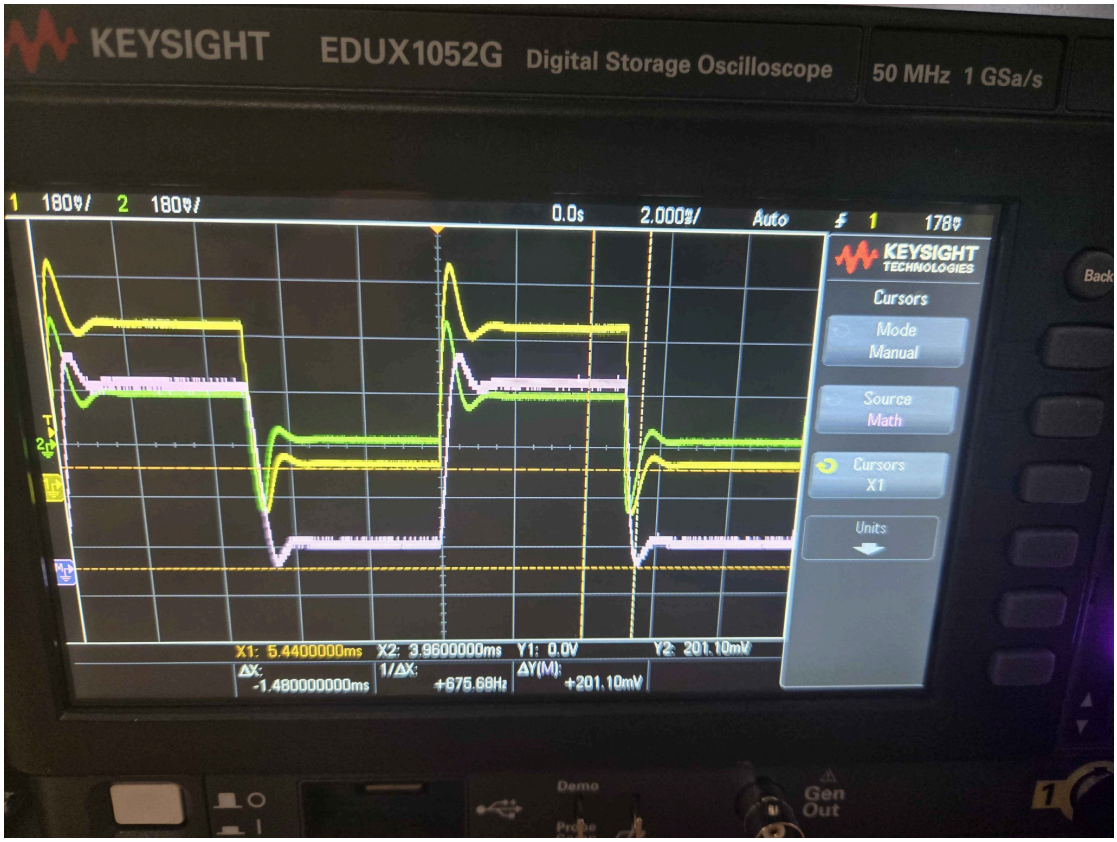
Steady state voltage before switch opens is ~537 mV, which is very close to my calculated steady state voltage for the capacitor

Steady state voltage before switch opens is ~1.022 V, which is very close to my calculated steady state voltage for the resistor

The voltage not a square wave bc of the ability of the capacitive and inductive elements to resist sudden changes in voltage/current, furthermore, these devices take time to "charge" up, and these effects combined result in "ringing"

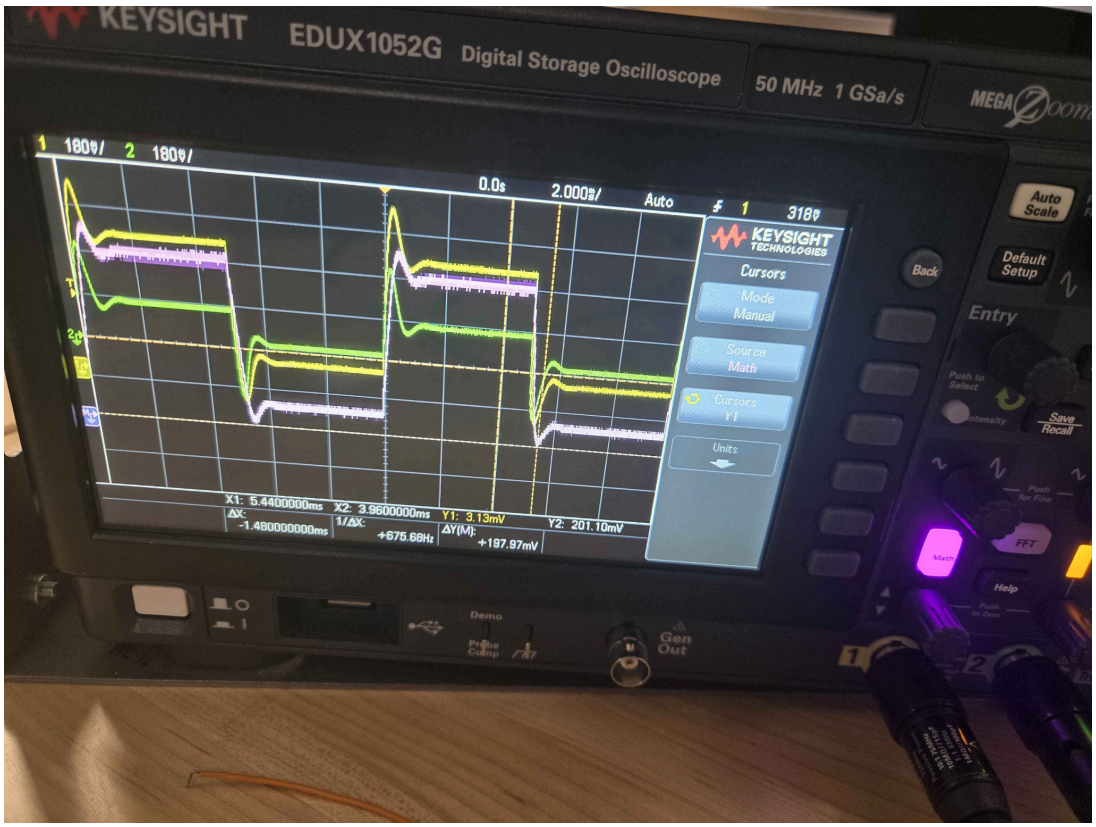
(4) Experiment:



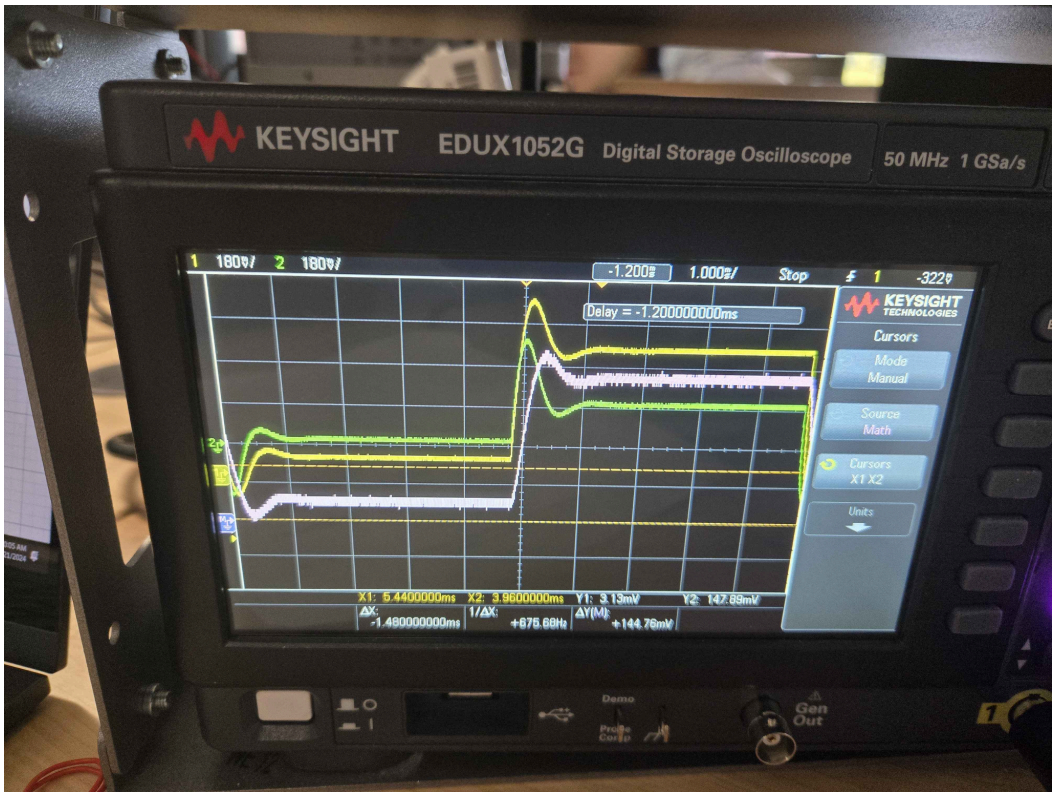

KEYSIGHT
EDUX1052G
Digital Storage Oscilloscope
50 MHz 1 GSa/s
1 180mV/ 2 180mV/
0.0s
2.000ms/
Auto
1780
KEYSIGHT TECHNOLOGIES
Cursors
Mode
Manual
Source
Math
Cursors
X1
Units
X1: 5.4400000ms X2: 3.9600000ms Y1: 0.0V Y2: 201.10mV
ΔX: -1.480000000ms
1/ΔX: +675.68Hz
ΔY(M): +201.10mV
Demo
Gen Out

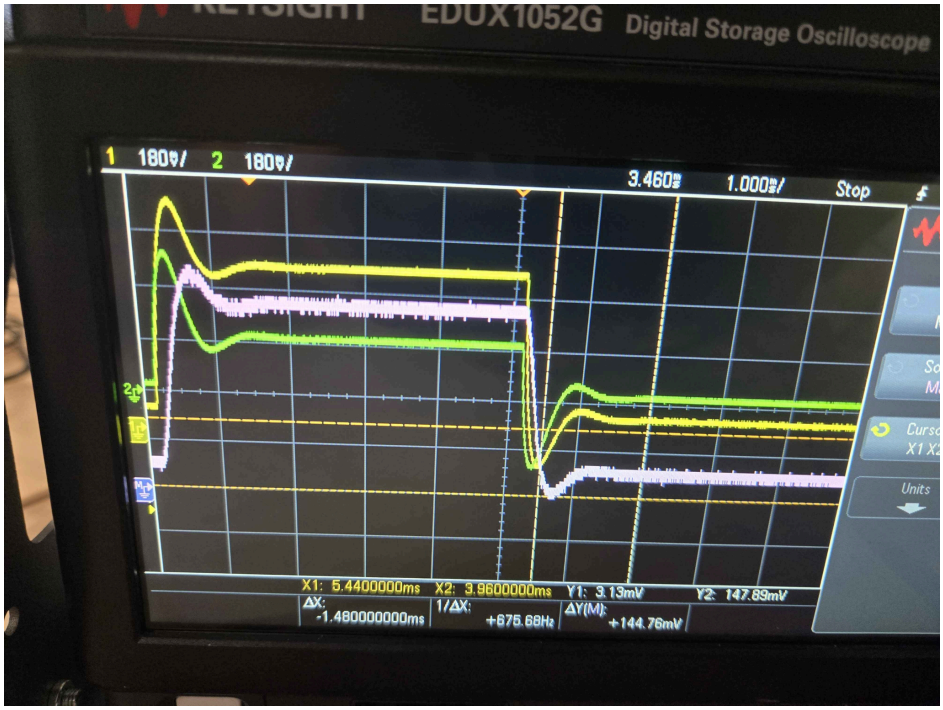

1 180mV/ 2 180mV/
0.0s
2.000ms/
Auto
Cursors
Mode
Manual
Source
Math
Cursors
Y1
Units
X1: 5.4400000ms X2: 3.9600000ms Y1: 0.0V Y2: 201.10mV
ΔX: -1.480000000ms
1/ΔX: +675.68Hz
ΔY(M): +201.10mV


KEYSIGHT
EDUX1052G
Digital Storage Oscilloscope
50 MHz 1 GSa/s
MEGAZoom
1 180mV/ 2 180mV/
0.0s 2.000ns/ Auto
1 318mV
KEYSIGHT TECHNOLOGIES
Cursors
Mode Manual
Source Math
Cursors Y1
Units
X1: 5.4400000ms X2: 3.9600000ms Y1: 397.51mV Y2: 201.10mV
ΔX: -1.4800000000ms 1/ΔX: +675.68Hz ΔY(M): -196.41mV
Auto Scale
Default Setup
Back
Entry
Analyze
Save Recall
FFT
Help
Demo
Probe Comp
Gen Out


KEYSIGHT
EDUX1052G
Digital Storage Oscilloscope
50 MHz 1 GSa/s
MEGAZoom
1 180mV/ 2 180mV/
0.0s 2.000ns/ Auto
1 318mV
KEYSIGHT TECHNOLOGIES
Cursors
Mode Manual
Source Math
Cursors Y1
Units
X1: 5.4400000ms X2: 3.9600000ms Y1: 3.13mV Y2: 201.10mV
ΔX: -1.4800000000ms 1/ΔX: +675.68Hz ΔY(M): +197.97mV
Auto Scale
Default Setup
Back
Entry
Save Recall
FFT
Help
Demo
Probe Comp
Gen Out


1 180mV/ 2 180mV/
0.0s 2.000ms/ Stop
Cursors
Mode Manual
Source Math
Cursors Y1
Units
X1: 5.4400000ms X2: 3.9600000ms Y1: 59.47mV Y2: 201.10mV
ΔX: -1.480000000ms 1/ΔX: +675.68Hz ΔY(M): +141.63mV

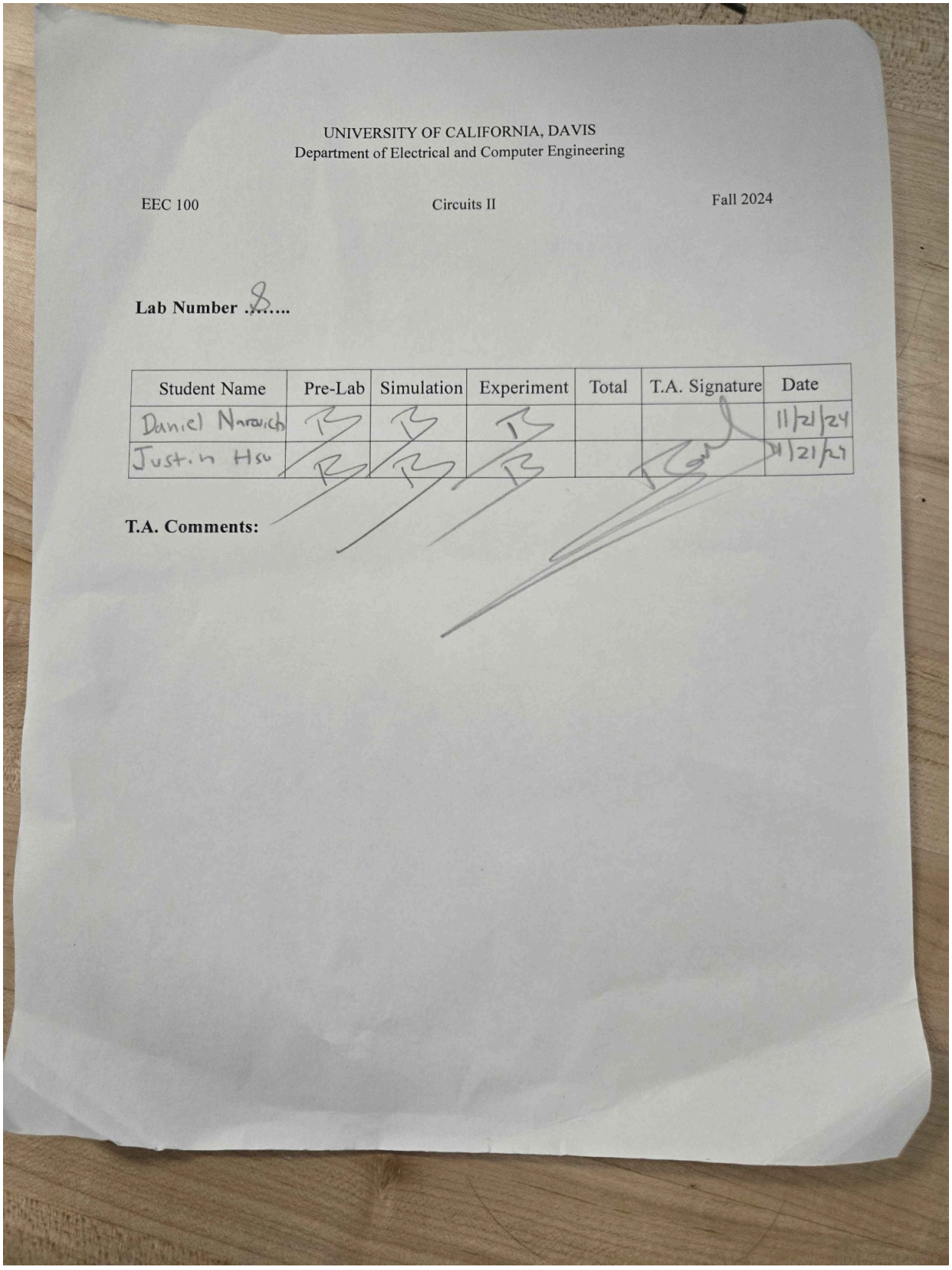

KEYSIGHT EDUX1052G Digital Storage Oscilloscope 50 MHz 1 GSa/s
1 180mV/ 2 180mV/
-1.200ns 1.000ns/ Stop
Delay = -1.200000000ms
KEYSIGHT TECHNOLOGIES
Cursors
Mode Manual
Source Math
Cursors X1 X2
Units
X1: 5.4400000ms X2: 3.9600000ms Y1: 3.13mV Y2: 147.89mV
ΔX: -1.480000000ms 1/ΔX: +675.68Hz ΔY(M): +144.76mV



(5) Conclusion:

Through using laplace transforms, I was able to calculate the voltage across a resistor in a RC circuit without having to solve difficult differential equations. My calculations were proven in lab by measuring the voltage across the resistor. However, due to not having 470 ohm resistors available, we had to use two 1000 ohm resistors in parallel to try and rectify it, and along with having other non idealities in the circuit such as varied capacitance and inductance values, and non ideal switch, our measurements were slightly off from the ideal results calculated from the prelab.

(6) Checkoff:



UNIVERSITY OF CALIFORNIA, DAVIS
Department of Electrical and Computer Engineering

EEC 100 Circuits II Fall 2024

Lab Number 8

Student Name	Pre-Lab	Simulation	Experiment	Total	T.A. Signature	Date
Daniel Narvaich	✓	✓	✓			11/21/24
Justin Hsu	✓	✓	✓			11/21/24

T.A. Comments: