Prelab 3

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Part 1:Integrator

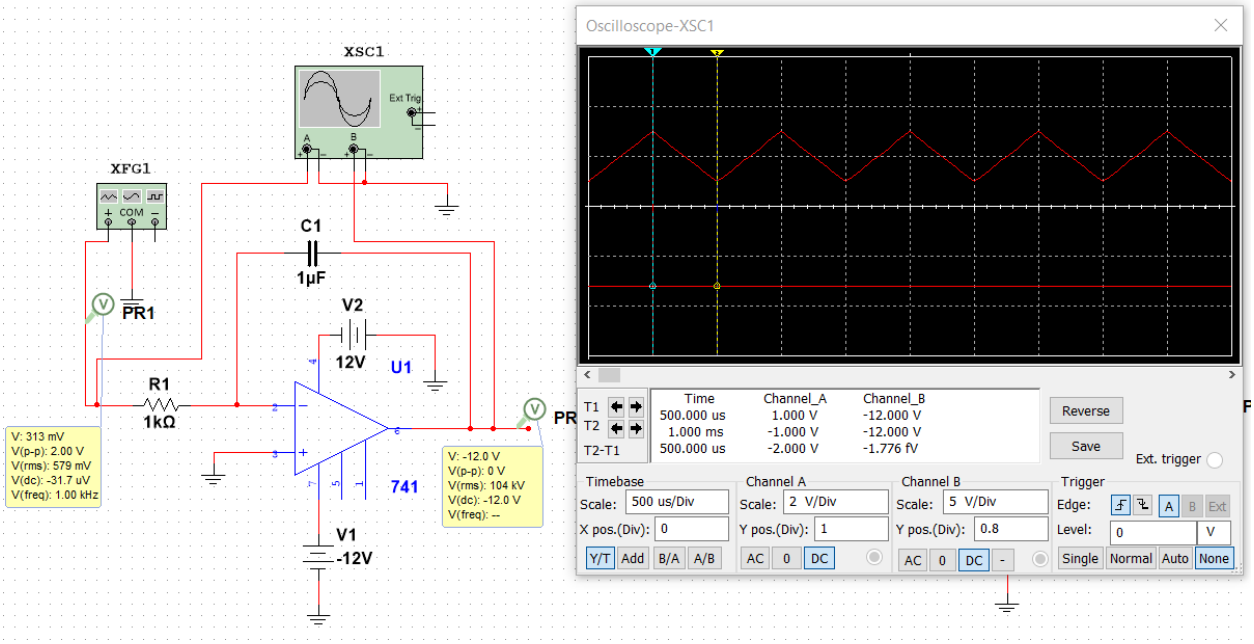

Figure 1. Integrator circuit with input and output waveforms

Table 1. Simulation results for Integrator

V_{INpp}(V) Tri,Sine,Square	R (kΩ)	Frequency (kHZ)	Capacitor (µF)	V_{OUT}(V) O-scope	V_{OUT} (v) probe
2	1	1	0.1	0	0
			1	-1.776 f	105 k
2			0.1	-1.776 f	12
			1	0	0
2			0.1	1.776 f	773
			1	-1.776 f	76.1

Part 2: Differentiator

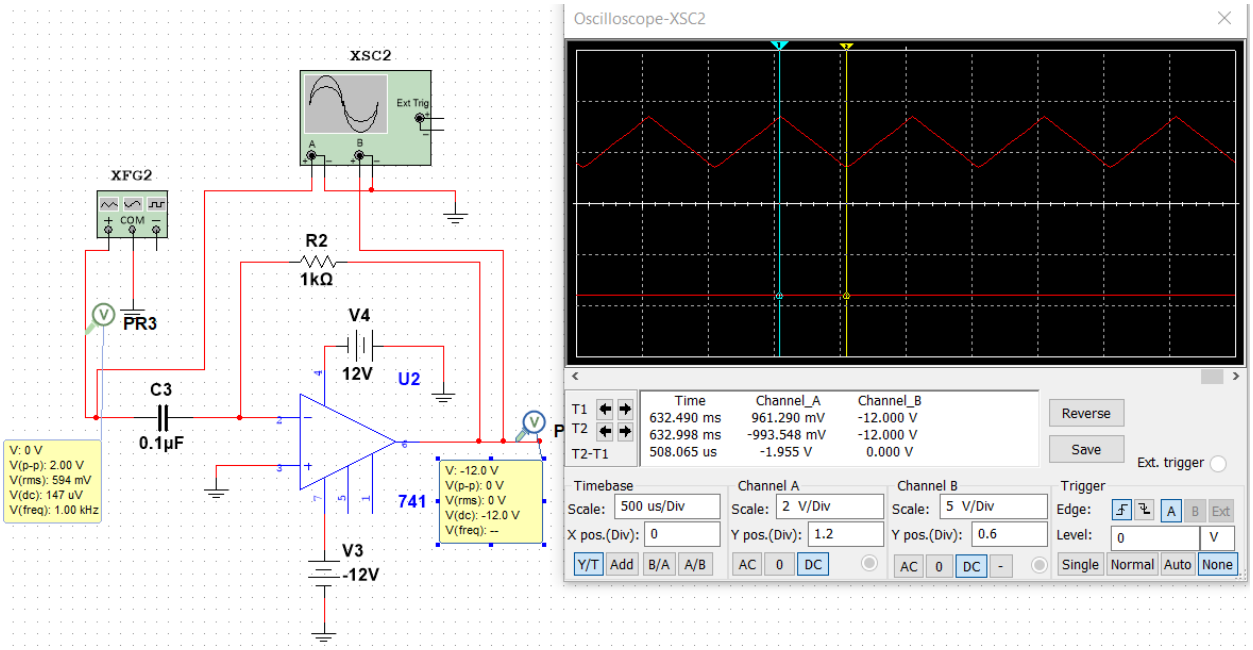

Figure 2. Differentiator circuit with input and output waveforms

Table 2. Simulation results for Differentiator

V_{INpp}(V) Tri,Sine,Square	R (kΩ)	Frequency (kHZ)	Capacitor (µF)	V_{OUT}(V) O-scope	V_{OUT}(V) probe
2	1	1	0.1	0	0
			1	0	0
2			0.1	0	0
			1	0	0
2			0.1	0	0
			1	0	0

Analysis

The input and output phase are very hard to see, because the capacitor causes the output to take time before it shows up by the probe and oscilloscope and even then its very small. Using X_c/R_{IN} as the equation for the gain, that would imply the gain for each scenario is 159 for 1 µF and 1591 for 0.1 µF, which intuitively does not seem right, and I more than likely used the wrong equation. Also, all of the V_{OUT}'s being the same doesn't seem right. For the integrator, it appears to have clipped outputs occurring for the triangle and since wave with 0.1 µF.

For the differentiator, I got no results. I double checked the circuit in the simulation and even tried changing which pin had the ±12 volts on it and couldn't get any readings. I did move the probe to right after the capacitor and there was voltage coming out of the capacitor but once the probe moved past the resistor I was getting nothing. I'm not sure what I did wrong, but I know that I should have

some reading for at least one of the scenarios. If gain is R/X_c, then for 0.1 µF it would be 0.628 and 6.28 for 1µF.

I did run each simulation for a few seconds (around 0.5 to 1 second according to the oscilloscope) so that the probes I placed for my own reference could get more solid readings. I also had to move the channel probes on the oscilloscope to channel B in order to find the output as it seems the capacitor causes it to only have an output some of the time, which intuitively would make sense considering the functionality of a capacitor. I also looked up references of the op-amps themselves on Google and know that the output wave is not what it should be. I have added the sites I used to check the op-amps' results I was getting in simulation as reference. (Integrator and Differentiator)