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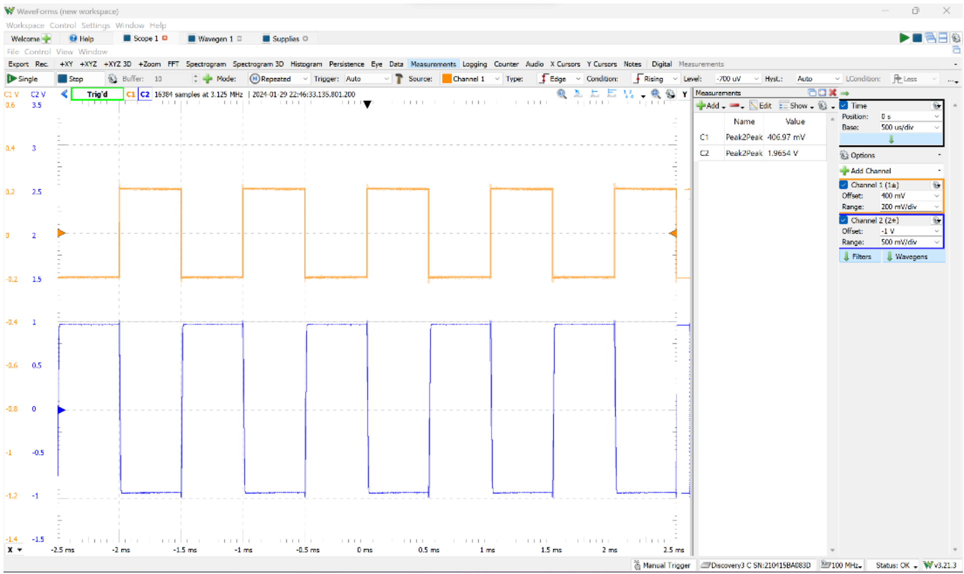
Kekae

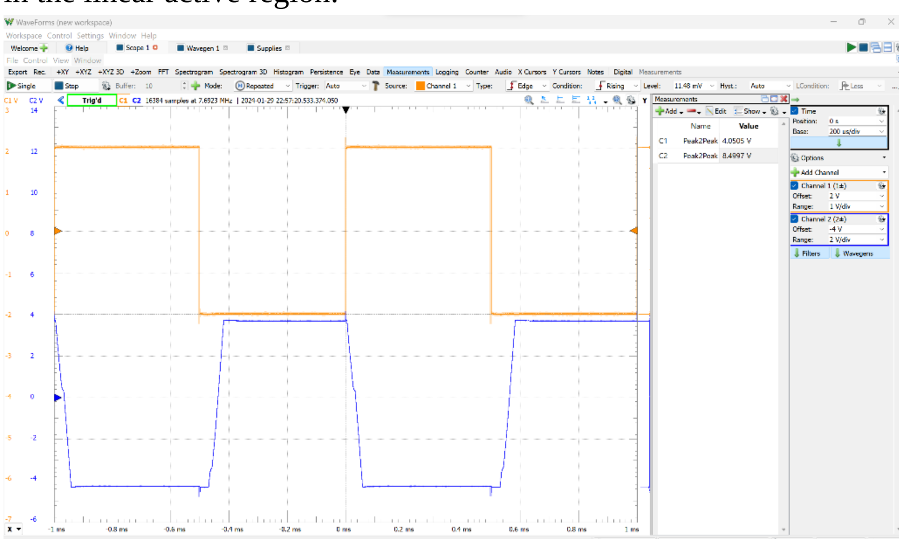
2CJ4 - Laboratory Experiments (Set 1)

1.

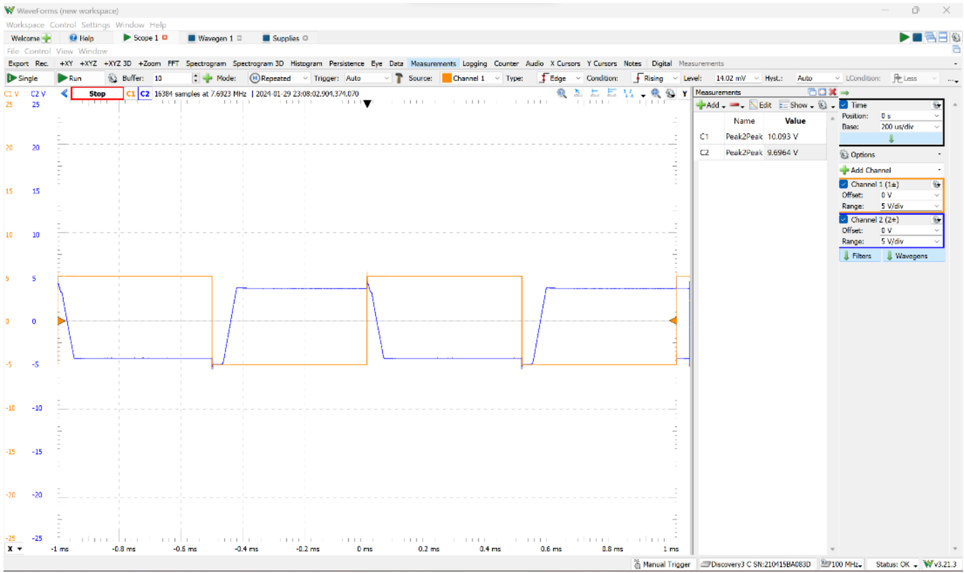
a. 200mV with $+V_{cc}$ = 5V and $-V_{cc}$ = -5V. When the output is greater than the V_{cc}, we are in the saturation region; however, when the output is less than the V_{cc}, we are in the linear active region.



b. 2V with $+V_{cc}$ = 5V and $-V_{cc}$ = -5V. When the output is greater than the V_{cc}, we are in the saturation region; however, when the output is less than the V_{cc}, we are in the linear active region.

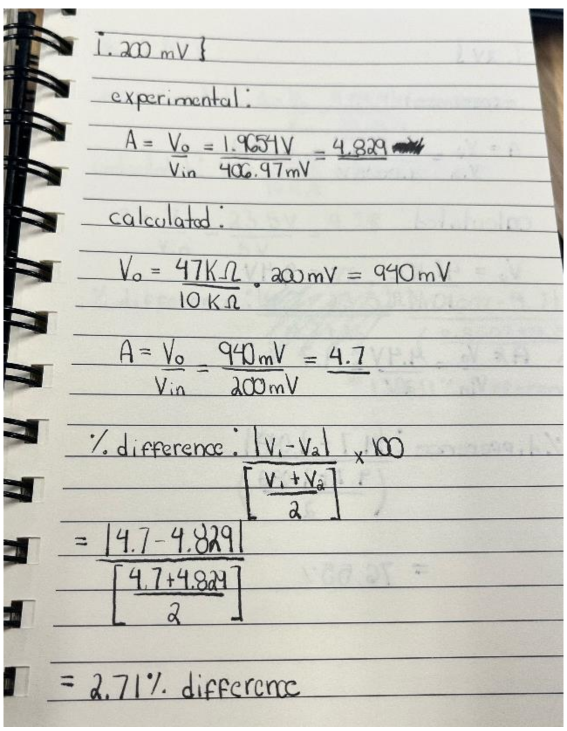


c. 5V with $+V_{cc}$ = 5V and $-V_{cc}$ = -5V. When the output is greater than the V_{cc}, we are in the saturation region; however, when the output is less than the V_{cc}, we are in the linear active region.



2.

a. 200mV with $+V_{cc}$ = 5V and $-V_{cc}$ = -5V


1. 200 mV

experimental:

$$A = \frac{V_o}{V_{in}} = \frac{1.9654V}{406.97mV} = 4.829$$

calculated:

$$V_o = \frac{47K\Omega}{10K\Omega} \cdot 200mV = 940mV$$

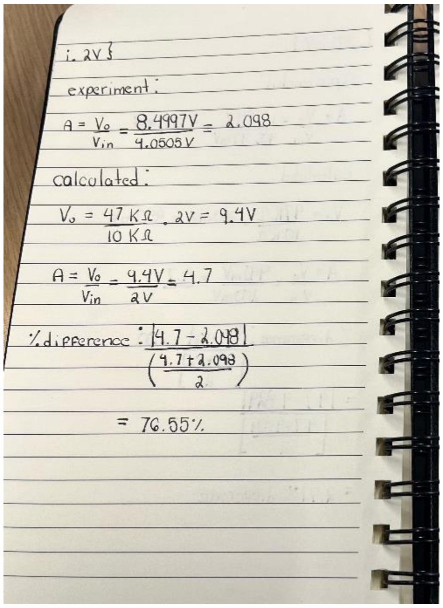
$$A = \frac{V_o}{V_{in}} = \frac{940mV}{200mV} = 4.7$$

$$\% \text{ difference}: \frac{|V_1 - V_2|}{\left[\frac{V_1 + V_2}{2}\right]} \times 100$$

$$= \frac{|4.7 - 4.829|}{\left[\frac{4.7 + 4.829}{2}\right]}$$

$$= 2.71\% \text{ difference}$$

b. 2V with $+V_{cc}$ = 5V and $-V_{cc}$ = -5V. We cannot calculate the gain in this scenario because of the characteristics of an op-amp. The gain is present; however, it results in an output voltage greater than the amplitude. The calculations result in an inaccurate gain.



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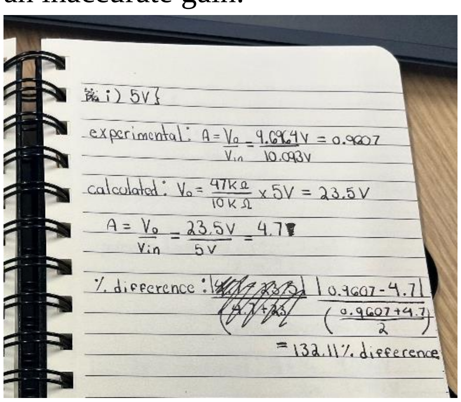
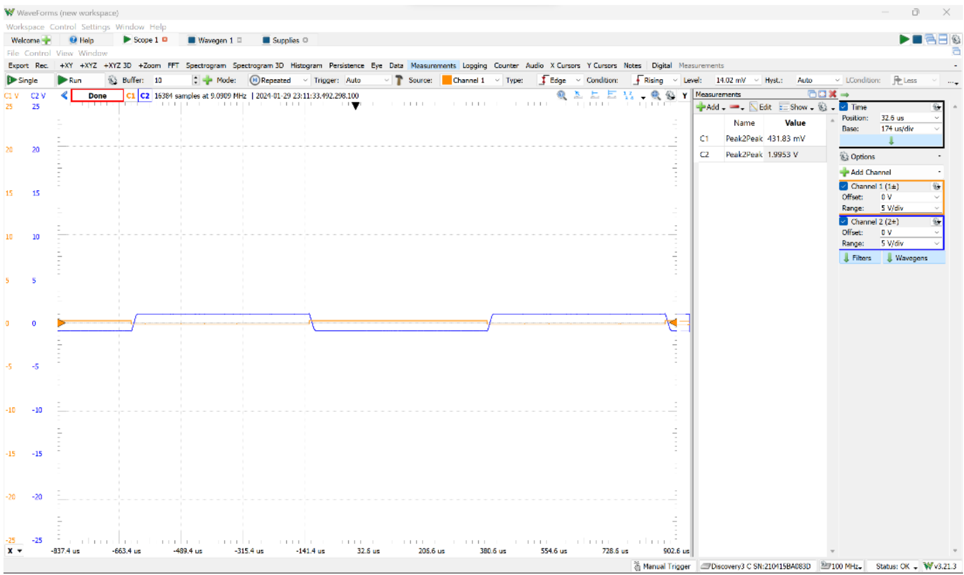
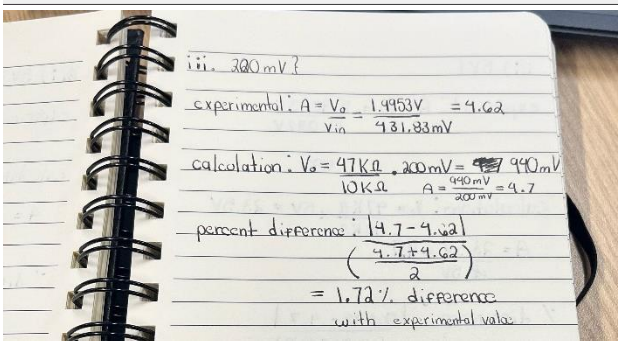


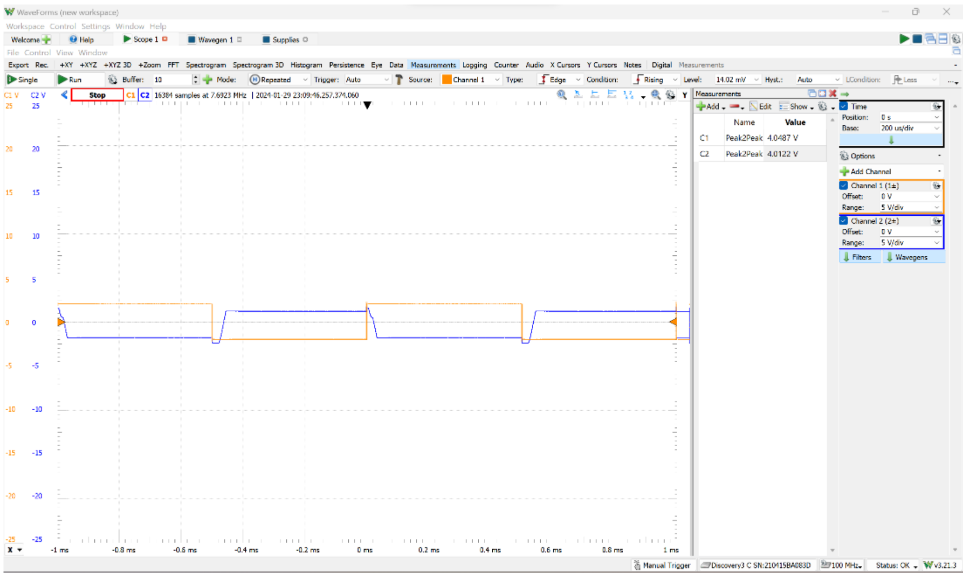
3.

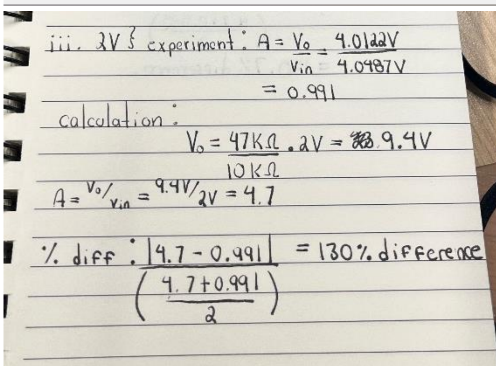
a. 200mV with $+V_{cc}$ = 2.5V and $-V_{cc}$ = -2.5V. When the output is greater than the V_{cc}, we are in the saturation region; however, when the output is less than the V_{cc}, we are in the linear active region. The gain is also the same regardless of the value of the values of $\pm V_{cc}$ as it is not taken into consideration when performing calculations.





b. 2V with $+V_{cc}$ = 2.5V and $-V_{cc}$ = -2.5V. When the output is greater than the V_{cc}, we are in the saturation region; however, when the output is less than the V_{cc}, we are in the linear active region. Again, we cannot calculate the gain in this scenario because of the characteristics of an op-amp. The gain is present; however, it results in an output voltage greater than the amplitude. The calculations result in an inaccurate gain. The gain is also the same regardless of the value of the values of $+-V_{cc}$ as it is not taken into consideration when performing calculations.





iii. 2V experiment: $A = \frac{V_o}{V_{in}} = \frac{4.0122V}{4.0487V}$

$= 0.991$

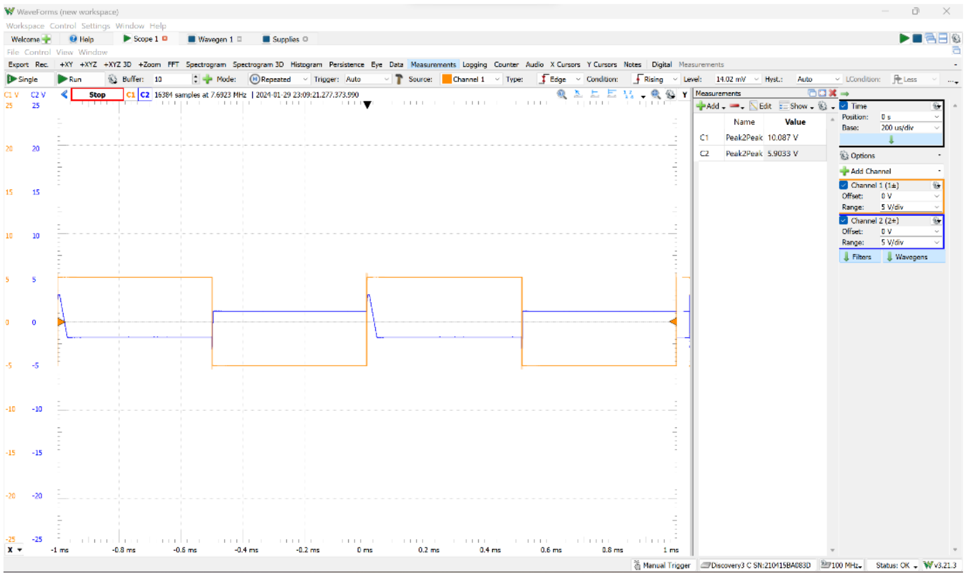
calculation:

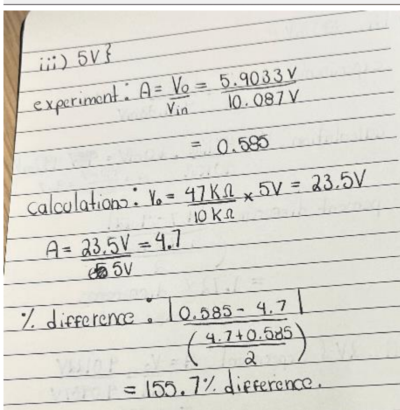
$V_o = \frac{47K\Omega}{10K\Omega} \cdot 2V = 9.4V$

$A = V_o/V_{in} = 9.4V/2V = 4.7$

% diff: $\frac{|4.7 - 0.991|}{\left(\frac{4.7+0.991}{2}\right)} = 130\%$ difference

c. 5V with $+V_{cc}$ = 2.5V and $-V_{cc}$ = -2.5V. When the output is greater than the V_{cc}, we are in the saturation region; however, when the output is less than the V_{cc}, we are in the linear active region. We cannot calculate the gain in this scenario because of the characteristics of an op-amp. The gain is present; however, it results in an output voltage greater than the amplitude. The calculations result in an inaccurate gain. The gain is also the same regardless of the value of the values of $\pm V_{cc}$ as it is not taken into consideration when performing calculations.





iii) 5V{

experiment: $A = \frac{V_o}{V_{in}} = \frac{5.9033\,V}{10.087\,V}$

$= 0.585$

calculations: $V_o = \frac{47\,K\Omega}{10\,K\Omega} \times 5V = 23.5V$

$A = \frac{23.5V}{5V} = 4.7$

% difference: $\frac{|0.585 - 4.7|}{\left(\frac{4.7+0.585}{2}\right)}$

$= 155.7\%$ difference.