EE281 EXPERIMENT 4

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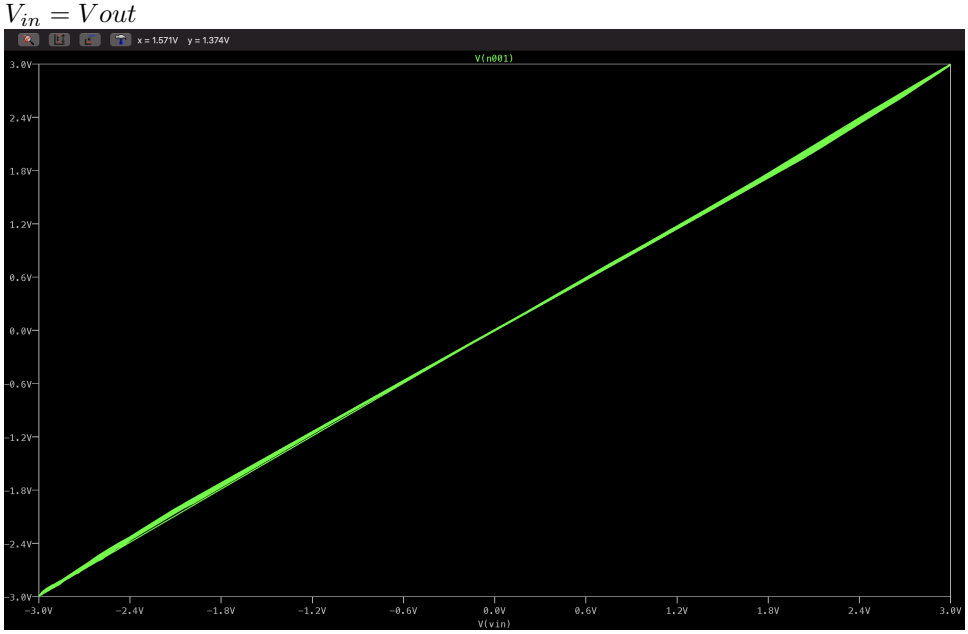
28th of November 2020(Took 6 Hours)

1 Preliminary Work

1.1 Question 1

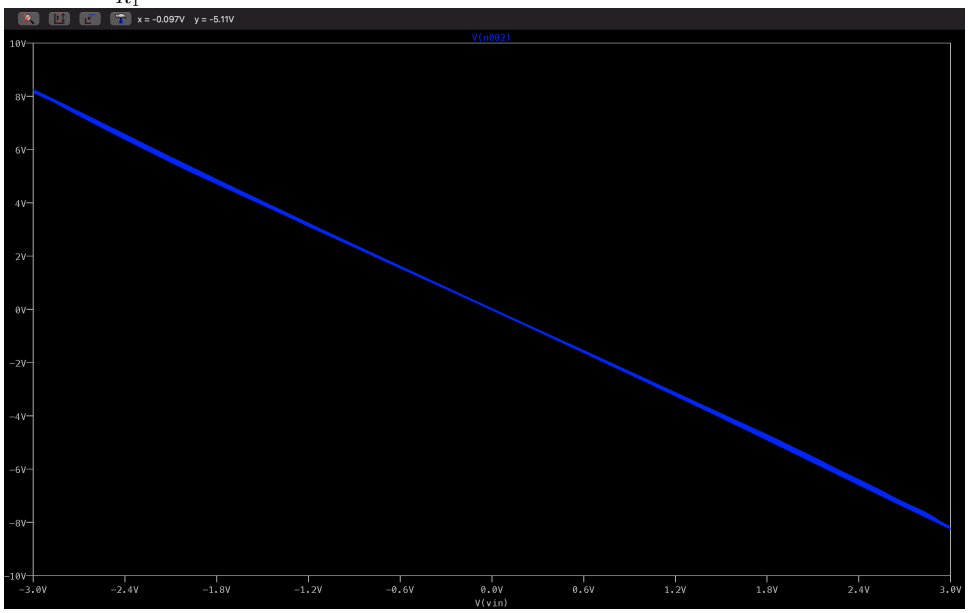
a. $V_3 = V_2$

$V_{in} = Vout$



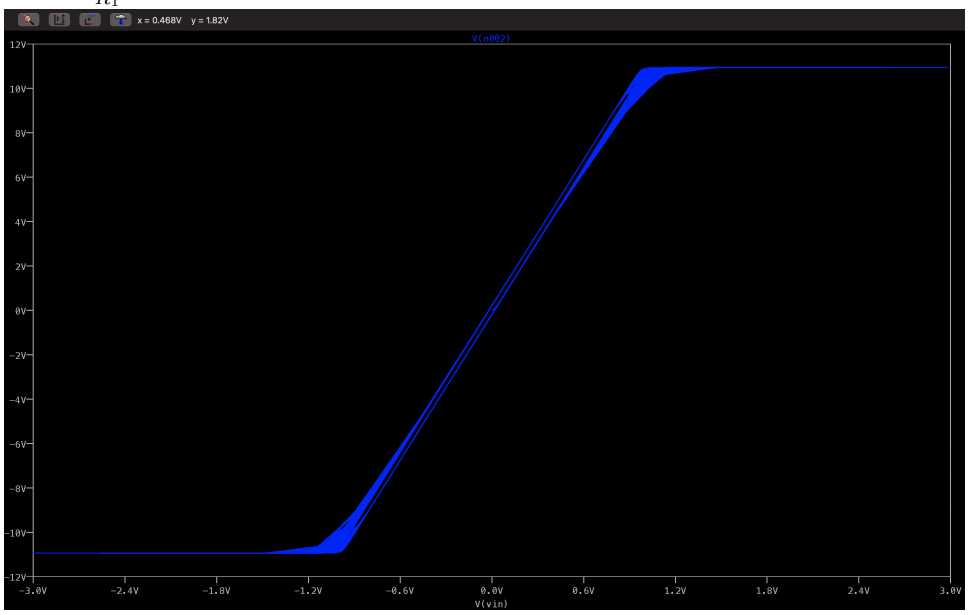
b. $V_3 = V_2 = 0$

$V_{out} = -\frac{V_{in}}{R_1} \times R_2$



c. $V_3 = V_2 = V_{in}$

$V_{out} = \frac{V_{in}}{R_1} \times R_2 + V_{in}$

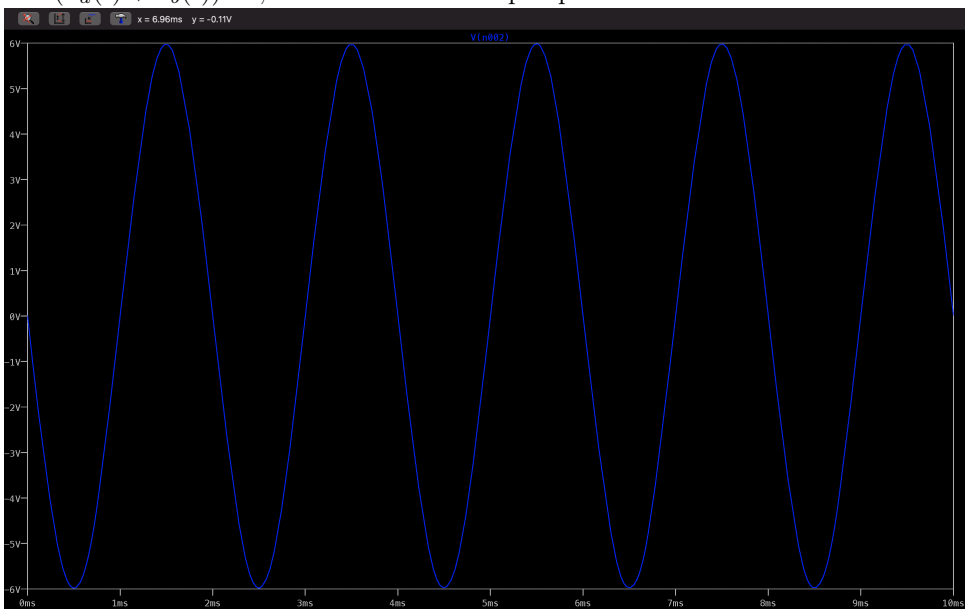


1.2 Question 2

a. $V_3 = V_2 = 0$

$(\frac{V_a(t)}{R_1} + \frac{V_b(t)}{R_2}) \times R_f$

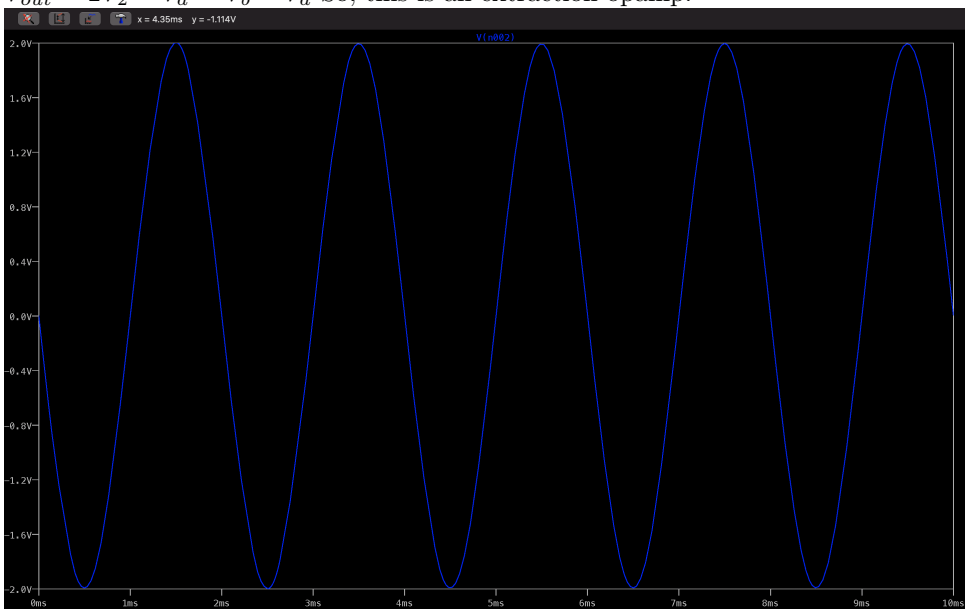
$= -(V_a(t) + V_b(t))$ So, this is an addition opamp.



b. $V_3 = V_2 = \frac{V_b}{R_2+R_4} \times R_4$

$V_{out} = -\frac{V_a - V_2}{R_1} \times R_3 + V_2$

$V_{out} = 2V_2 - V_a = V_b - V_a$ So, this is an extraction opamp.



c. $V_3 = V_2 = \frac{V_i n - 2}{R_1+R_2} \times R_2 + 2V$

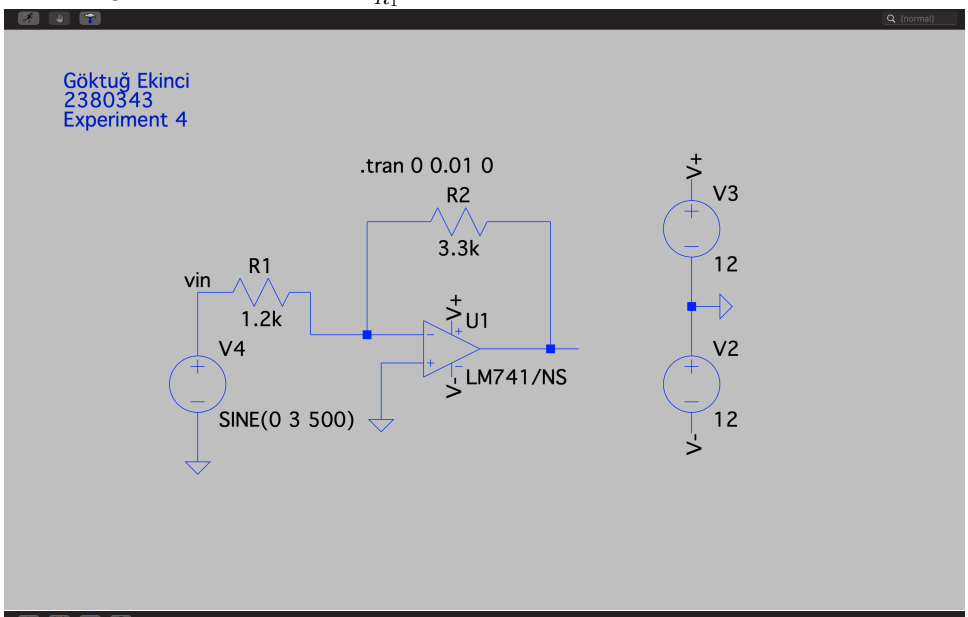
$V_{out} = \frac{V_2}{R_1} \times R_2 + V_2$

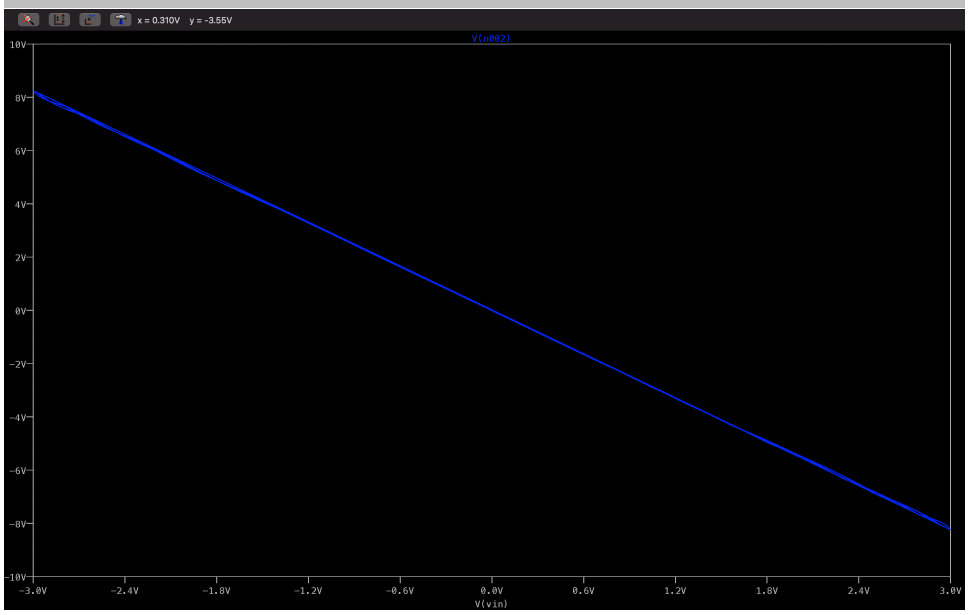
$V_{out} = \frac{33 \times V_{in} - 200}{100}$

2 Experimental Work

2.1 Figure 1&2

Set up the Figure 5 and adjusted voltage source to sinusodial wave form, 500Hz and 3 for amplitude. Added a label right after V_{in}.$V_{out} = -\frac{V_{in}}{R_1} \times R_2$

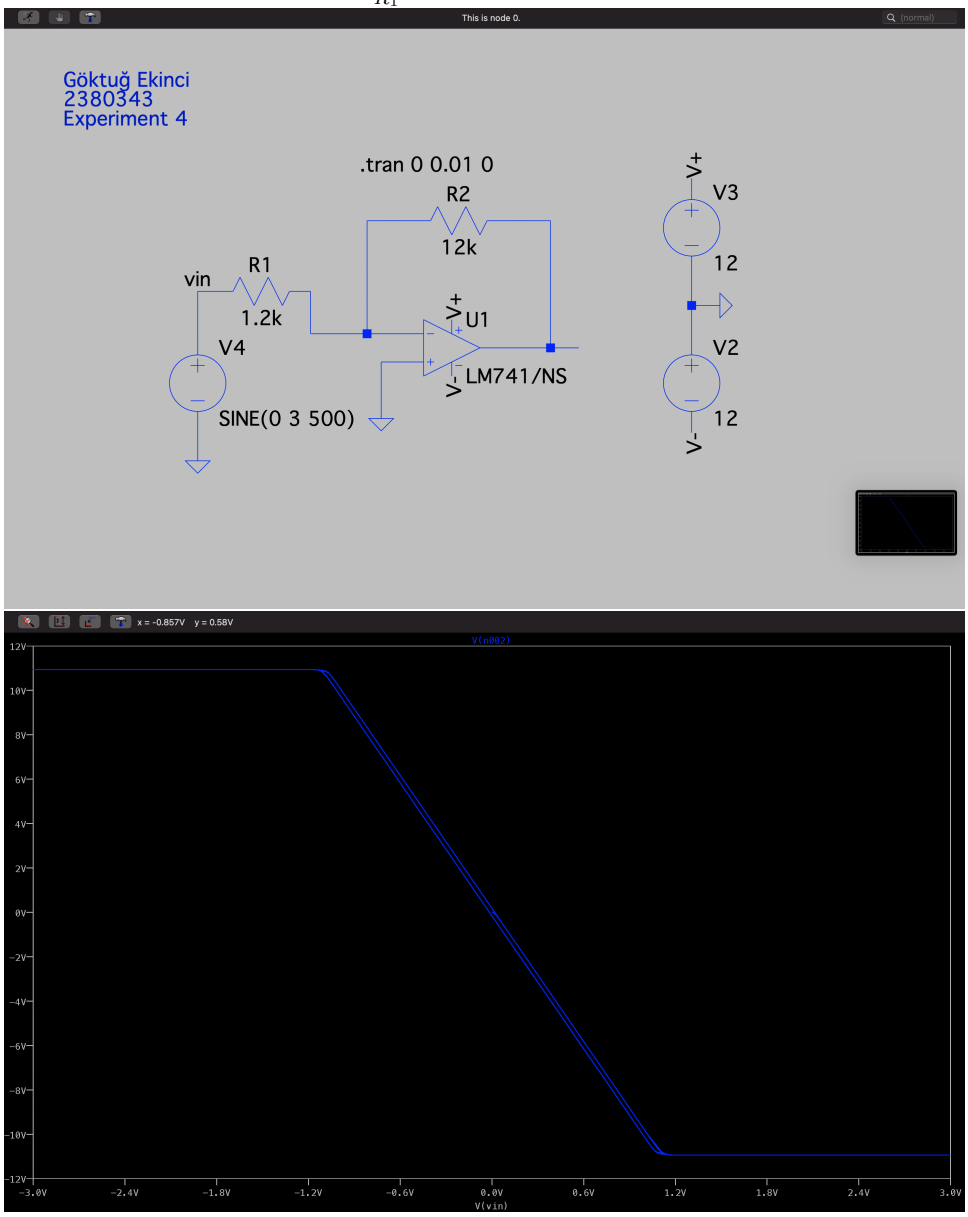




Experimental Gain: $16/6 = 2.67$

2.2 Figure 3&4

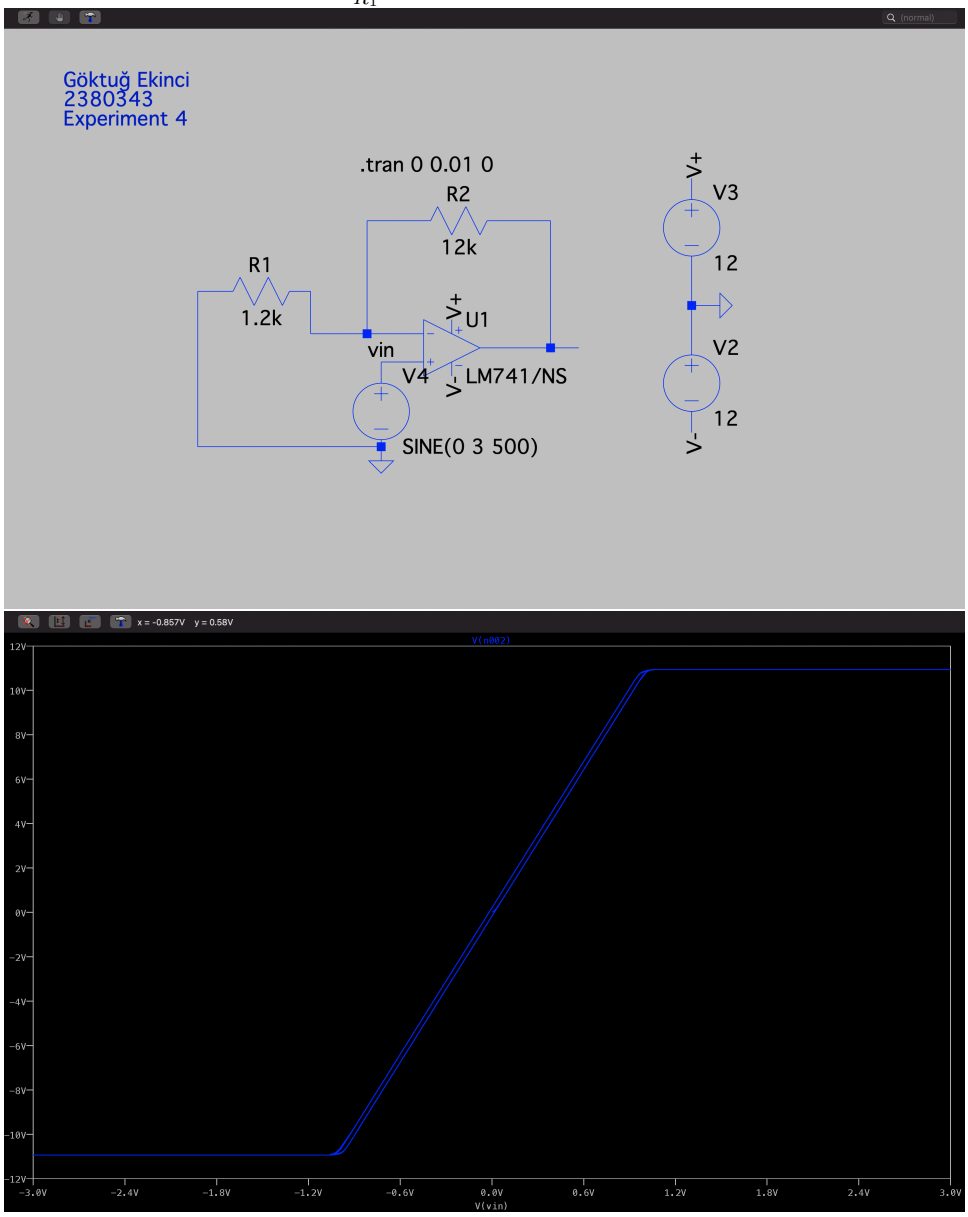
Set up the Figure 10 and adjusted voltage source to sinusodial wave form, 500Hz and 3 for amplitude. Added a label right after $V_{in}.V_{out} = -\frac{V_{in}}{R_1} \times R_2$



Experimental gain except the saturation: -9.8

2.3 Figure 5&6

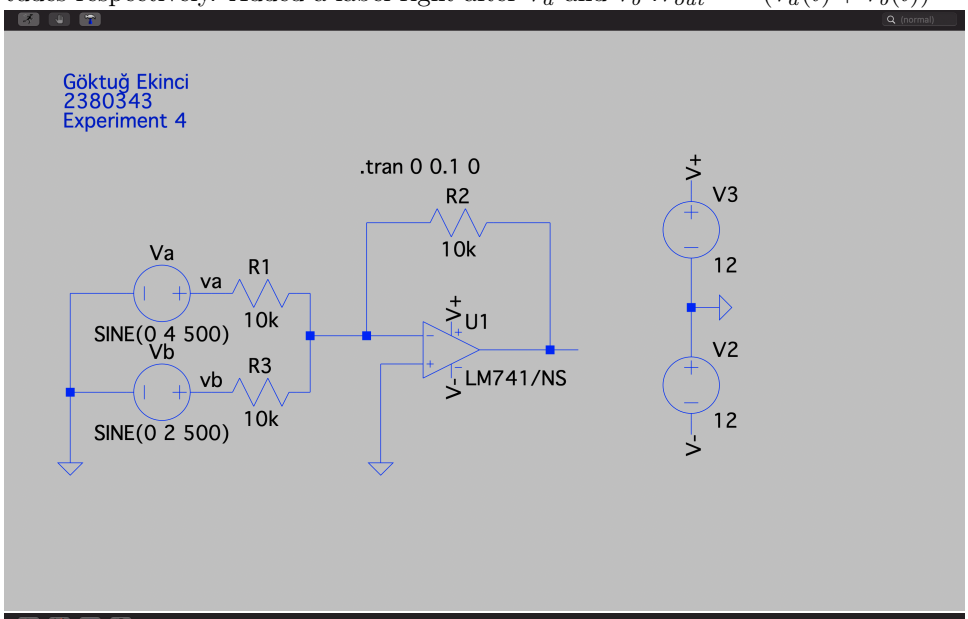
Set up the Figure 6 and adjusted voltage source to sinusodial wave form, 500Hz and 3 for amplitude. Added a label right after V_{in}.$V_{out} = \frac{V_{in}}{R_1} \times R_2 + V_{in}$

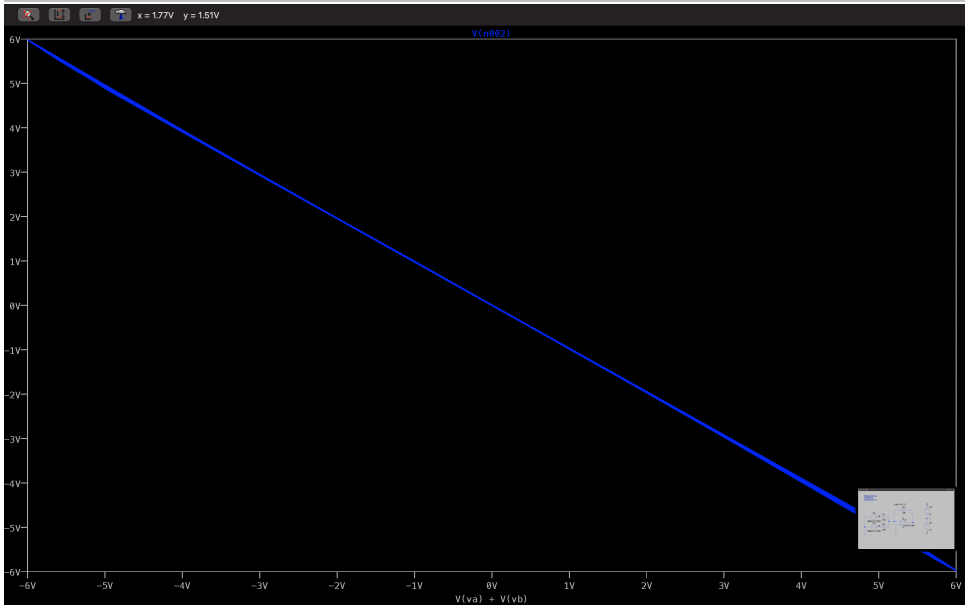


Experimental gain except the saturation: 10.3

2.4 Figure 7&8

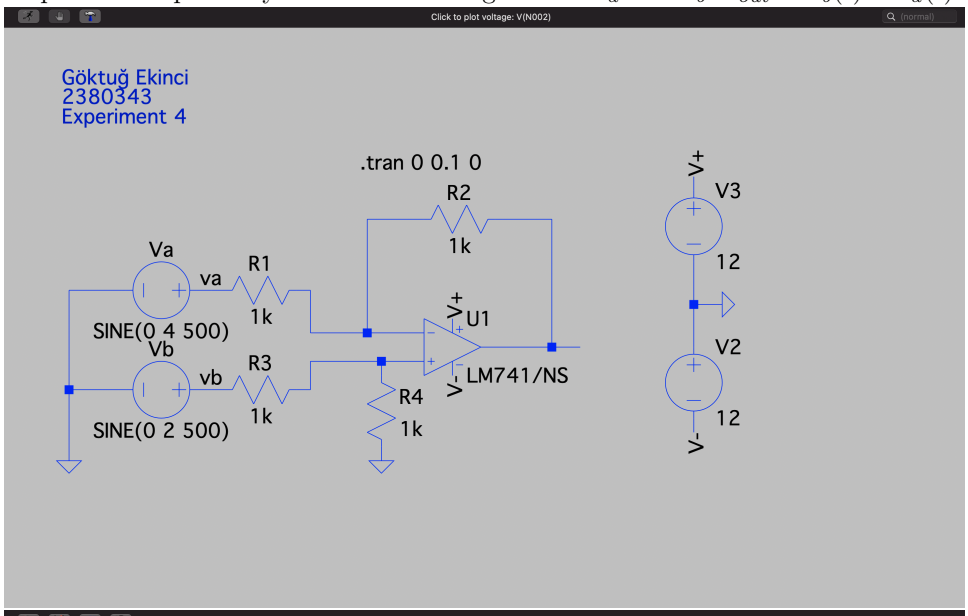
Set up the Figure 7 and adjusted voltage sources to sinusodial wave form, 500Hz for both and 2,4 for amplitudes respectively. Added a label right after V_a and V_b .$V_{out} = -(V_a(t) + V_b(t))$

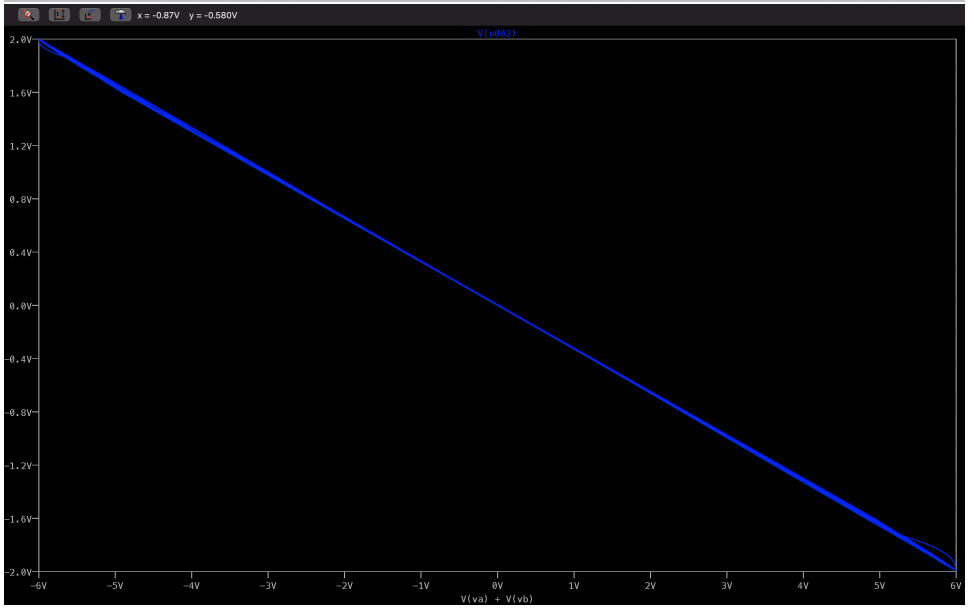




2.5 Figure 9&10

Set up the Figure 8 and adjusted voltage sources to sinusodial wave form, 500Hz for both and 2,4 for amplitudes respectively. Added a label right after V_a and V_b .$V_{out} = V_b(t) - V_a(t)$

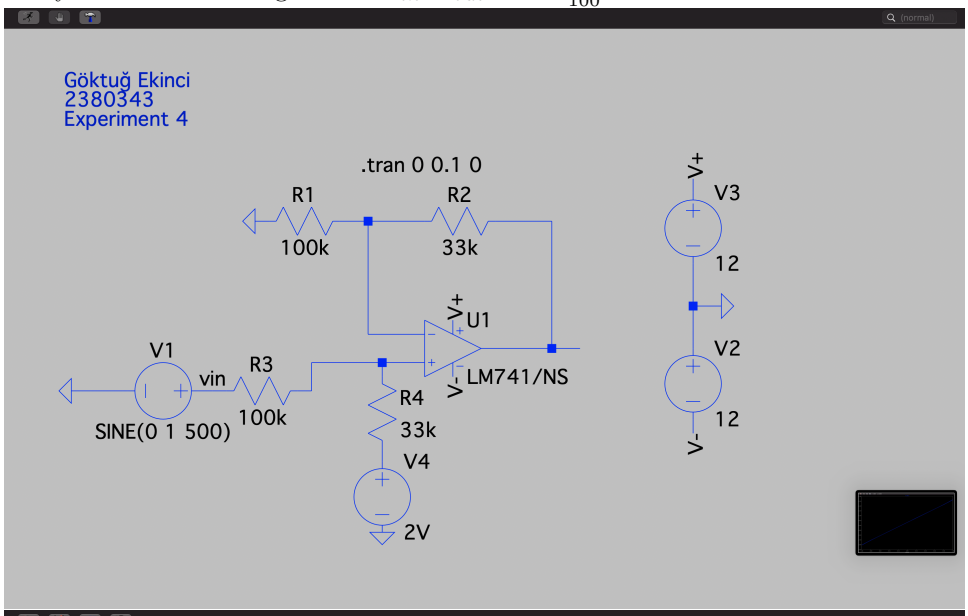


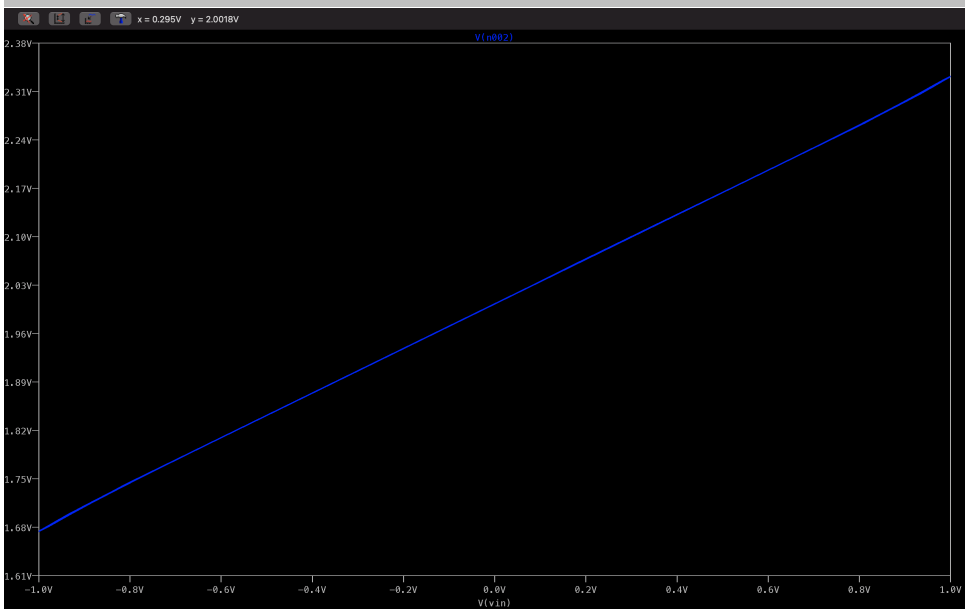


Slopes are both -1 = V_{out}/V_{in}.

2.6 Figure 11&12

Set up the Figure 9 and adjusted voltage source to sinusodial wave form, 500Hz and 1 for amplitude respectively. Added a label right after V_{in} .$V_{out} = \frac{33 \times V_{in} - 200}{100}$





Slope: 33/100.