Experiment 6

Op-Amp Circuits I

Pre-Lab Report

Question 1:

Prove theoretically that for an ideal op-amp, the relation between the output voltage and the input voltage of the inverting amplifier shown in part A of this experiment is $V_o = -\frac{R_2}{R_1} V_I$.

For an ideal operational amplifier:
Vp=Vn=0 in this case
Applying KCL on the negative inverting node:
[(Vn-V1)/R1] + [(Vn-Vo)/R2] = 0 with Vn=0
-V1/R1=Vo/R2
Thus, Vo= -(R2*V1)/R1
Vo=-V1*(R2/R1)

Question 2:

Prove theoretically that for an ideal op-amp, the relation between the output voltage and the input voltage of the non-inverting amplifier shown in part B of this experiment is $V_o = \left(1 + \frac{R_2}{R_1}\right) V_I$.

For an ideal op-amp: Vn=Vp=V1 as indicated in the figure
Applying KCL for the negative inverting node:
V1/R1+(V1-Vo)/R2=0
Vo= R2(V1/R1) + V1
Vo= V1*(1 + R2/R1)

Question 3:

Prove theoretically that for an ideal op-amp, the relation between the output voltage and the input voltage of the unity gain non-inverting amplifier shown in part C of this experiment is ***Vo = Vi.***

For an ideal operational amplifier: Vp=Vn
In this case: Vp=V1 and Vn=Vo
Thus, by substitution: V1=Vo