Name: _____

MUST 382 / EELE 491

Spring 2014
Lab experience #4

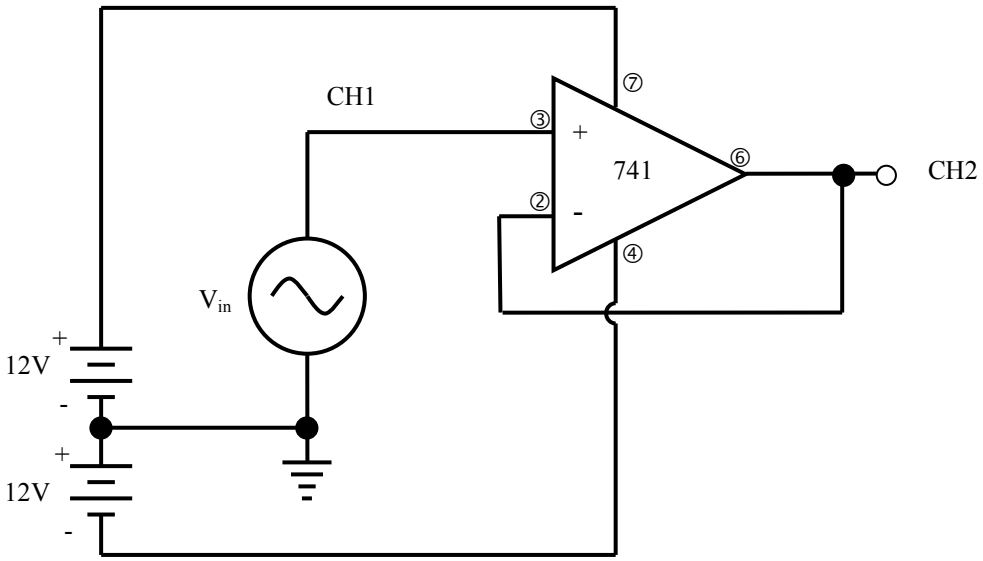
Procedure

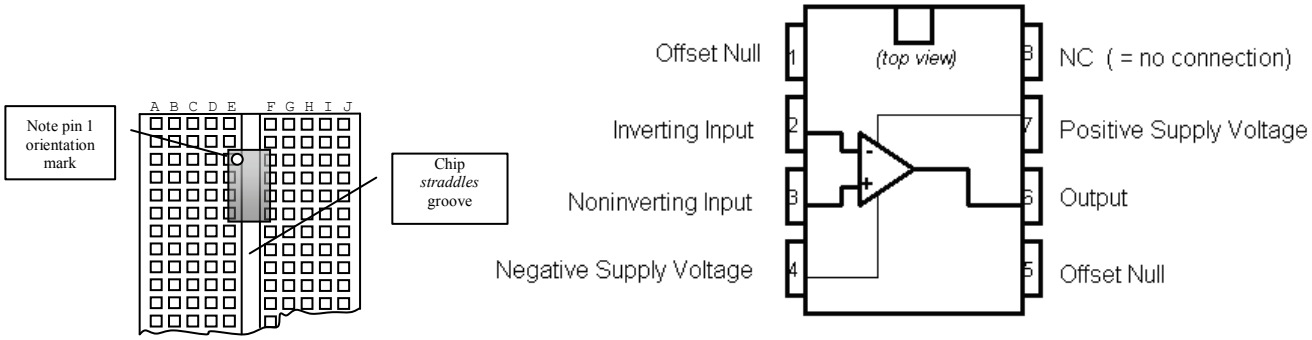
Your kit has four 8-pin DIP packages: two are type 741 op amps and two are another type of op amp, the OP-27. Today we will use one of the type 741 op amp from your kit.

P1. Consider the op amp circuit shown below. Once the chip is inserted in the breadboard, connect a jumper wire between pins 2 and 6.

> REMEMBER TO ASSEMBLE THE CIRCUIT WITH THE POWER SUPPLY AND FUNCTION GENERATOR OFF, then TEST and VERIFY the bench supply and the function generator to make sure the voltages are correct, turn them off again BEFORE connecting to the circuit, and then turn on the power supply first, followed by the function generator at minimum amplitude.

Make connections for the power supply and signal generator. You will need to ensure that the power supplies and function generator all share the same electrical ground point. Only turn on the power after your setup has been reviewed and approved by the lab instructor. This circuit is known as a *voltage follower*, or a *voltage buffer*.





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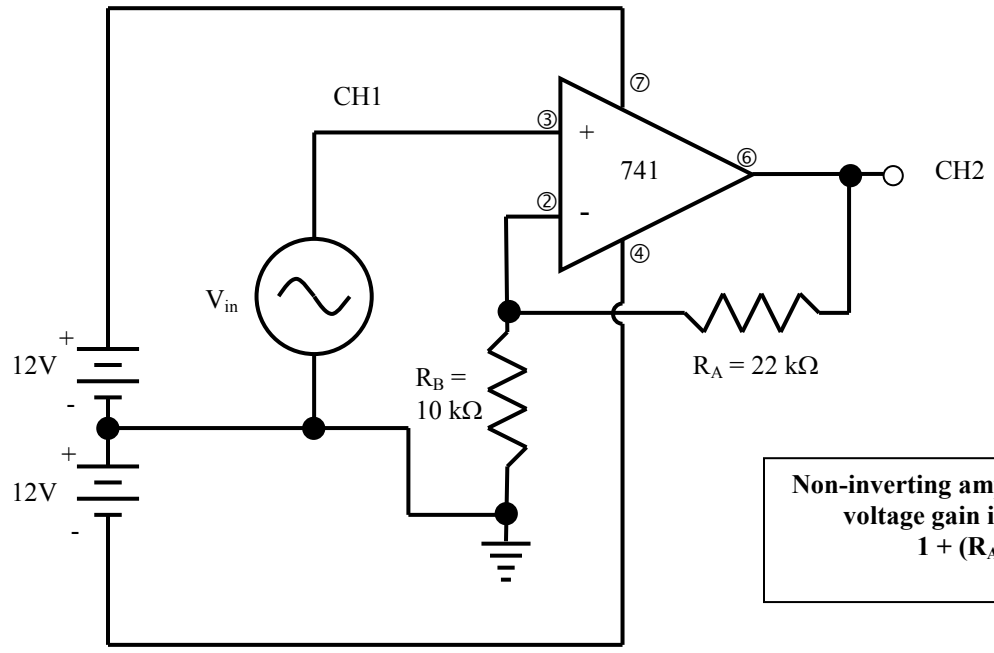
Use the function generator and the oscilloscope to observe simultaneously the V_{in} voltage (CH1) and the V_{out} voltage at the op amp's output (CH2).

With the function generator set for 1 kHz sinusoidal output, complete the table below:

CH1 Voltage Vin (p to p)	*CH2 Output Voltage (p to p)*	*Gain (Vout/Vin)*
100 mV		
500 mV		
1 V		
4 V		
8 V		

Comment on these results:

P2. With the DC power supplies and the function generator OFF, carefully assemble the *non-inverting amplifer* configuration shown here:



Non-inverting amplifier configuration: voltage gain is expected to be: $1 + (R_A/R_B) = 3.2$

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As in part 1, use the function generator and the oscilloscope to observe simultaneously the source voltage (CH1) and the voltage at the op amp's output (CH2).

With the function generator set for 1 kHz sinusoidal output, complete the table below:

CH1 Voltage Vin (p to p)	***CH2 Output Voltage (p to p)***	***Gain (Vout/Vin)***
100 mV		
500 mV		
1 V		
4 V		
8 V*		

**What happens to the output for this circuit configuration when V_{in} is 8V peak to peak?*

P3. Choose two different resistors for R_A and R_B, calculate the expected voltage gain using $(1+R_A/R_B)$, then make measurements to show the gain behavior. REMEMBER TO TURN OFF THE POWER BEFORE MODIFYING THE CIRCUIT, THEN REMEMBER TO TURN THE POWER BACK ON WHEN YOU ARE READY TO MAKE MEASUREMENTS.

Chosen R_A = _____ Chosen R_B = _____ Expected gain = _____

Choose a reasonable range of input voltages to demonstrate the gain.

CH1 Voltage Vin (p to p)	***CH2 Output Voltage (p to p)***	***Gain (Vout/Vin)***

Comments:

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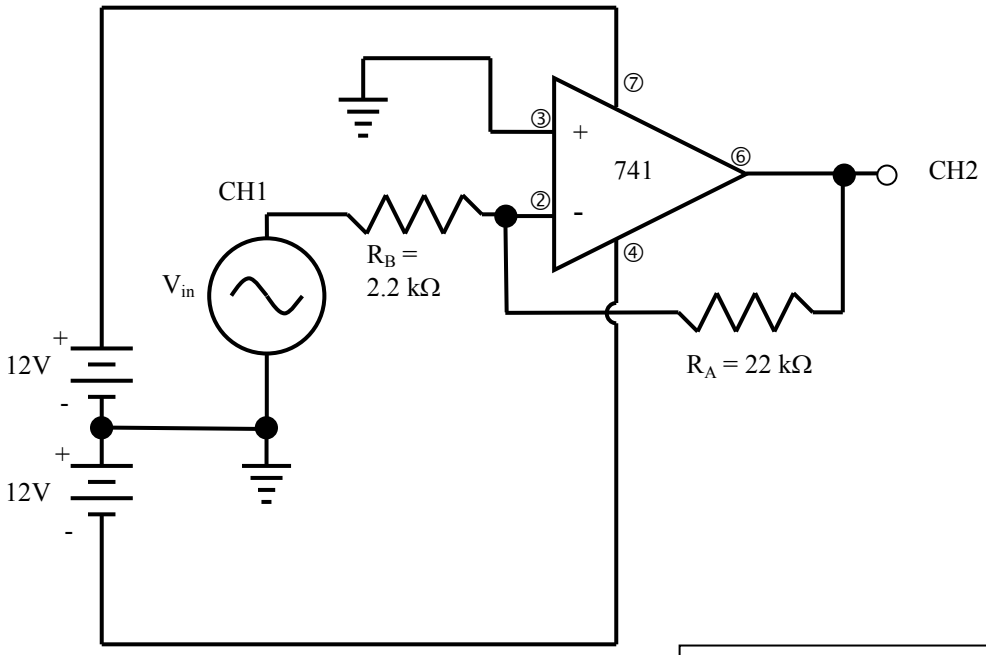
P4. Now construct the circuit shown below. REMEMBER TO TURN OFF THE POWER BEFORE MODIFYING THE CIRCUIT, THEN REMEMBER TO TURN THE POWER BACK ON WHEN YOU ARE READY TO MAKE MEASUREMENTS.

This circuit is an *inverting amplifier* configuration: when the input voltage is positive, the output voltage is negative, and vice versa.



Inverting amplifier configuration:
voltage gain is expected to be:
$-(R_A/R_B) = -10$

CH1 Voltage Vin (p to p)	*CH2 Output Voltage (p to p)*	*Gain (Vout/Vin)*
100 mV		
500 mV		
1 V		
2 V		
5 V*		

**What happens to the signal from this circuit configuration if the output amplitude gets too big?*