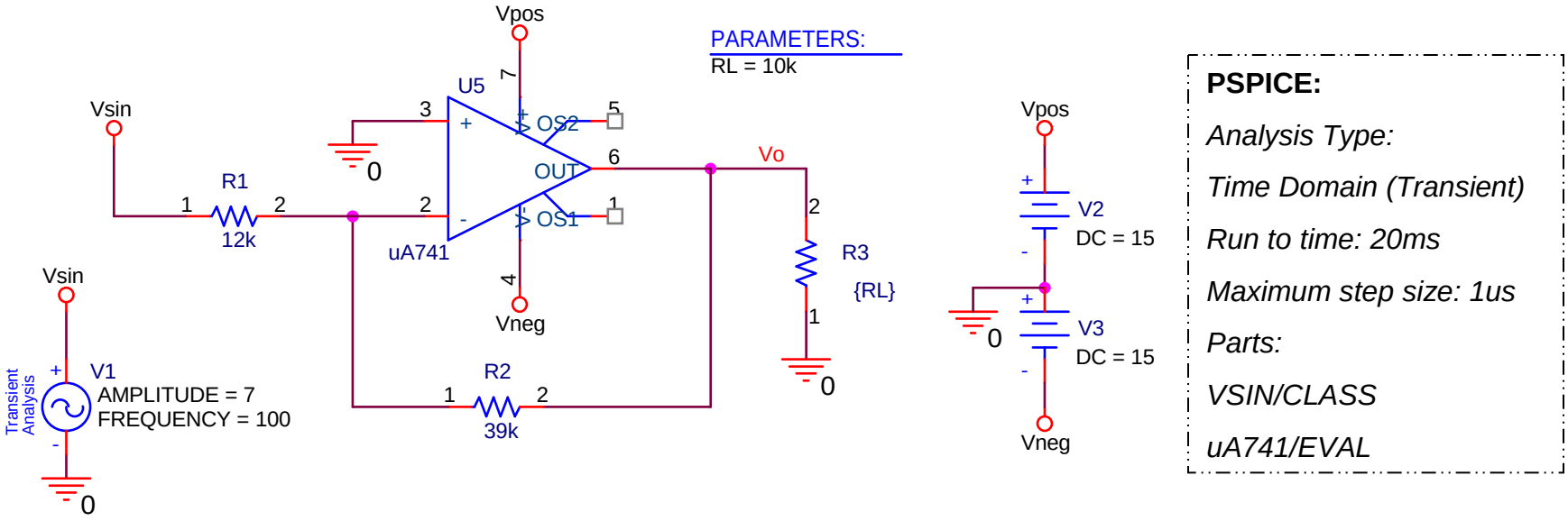
Lecture 4 Goals:

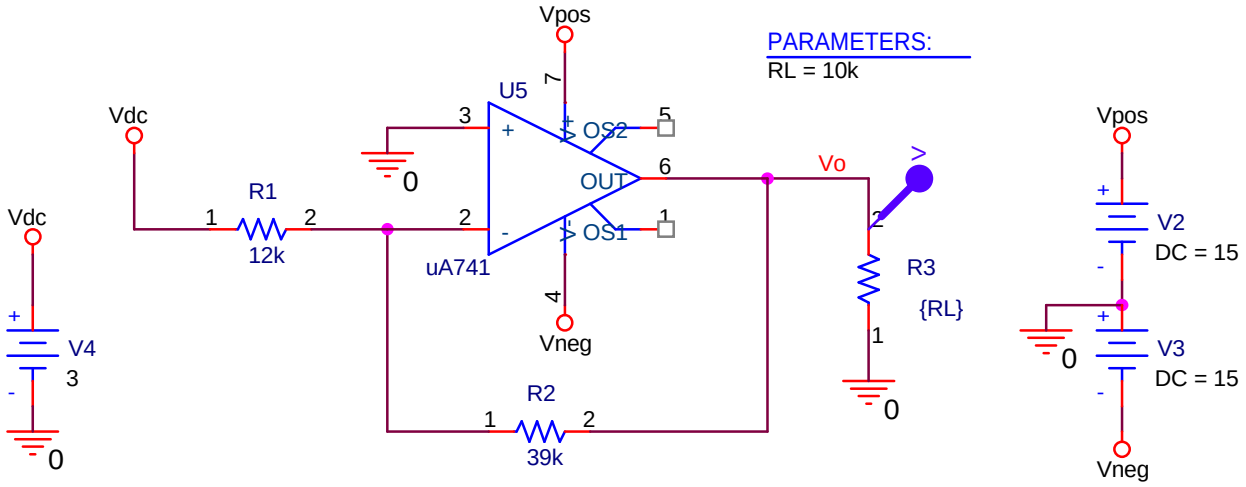
- New PSpice Simulation:
  Time Domain (Transient)
- Ideal DC Voltage Source
- Difference Amplifier
- Light meter Design

PART 1: Inverting Amplifier With Sinewave Input



- Run a Time Domain (Transient) with AMPLITUDE = {1, 3, 5, 7} Volts
- For AMPLITUDE = 1V and 7V do the following:
  - Label which waveform is input and which is output
  - Mark the peak for Input and Output
- For all amplitudes explain the form of the waveforms. Explain why some outputs are distorted.

PART 2: Inverting amplifier acting as an ideal DC voltage source



PSPICE:

Analysis Type: DC Sweep

Global Parameter: RL

Sweep Type: Linear

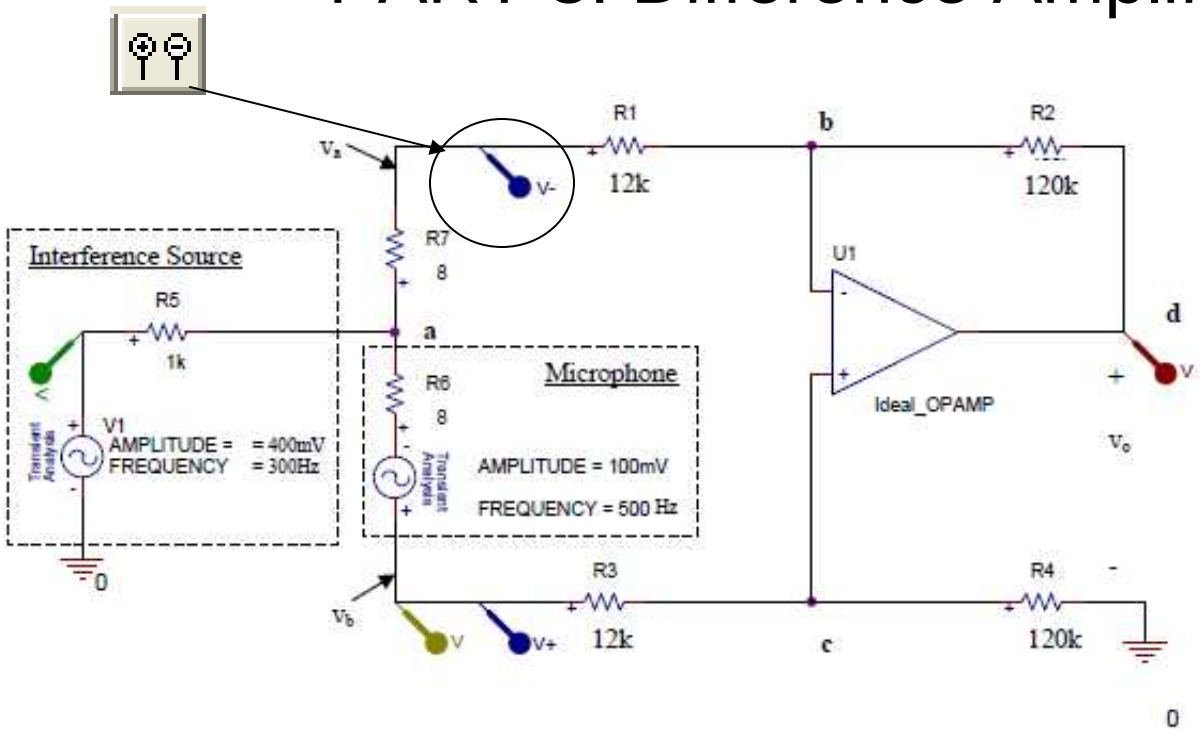
Start Value: 50Ω

End Value: 1k Ω

Increment: 50Ω

- Run a DC Sweep, sweeping the load resistance
- From the plot:
  - What is the value of this voltage source?
  - What is the range of RL over which it acts ideal?
  - Why is it acting ideal?

PART 3: Difference Amplifier



PSPICE:

Analysis Type:

Time Domain (Transient)

Run to time: 20ms

Maximum step size: 1us

Parts:

OPAMP/CLASS

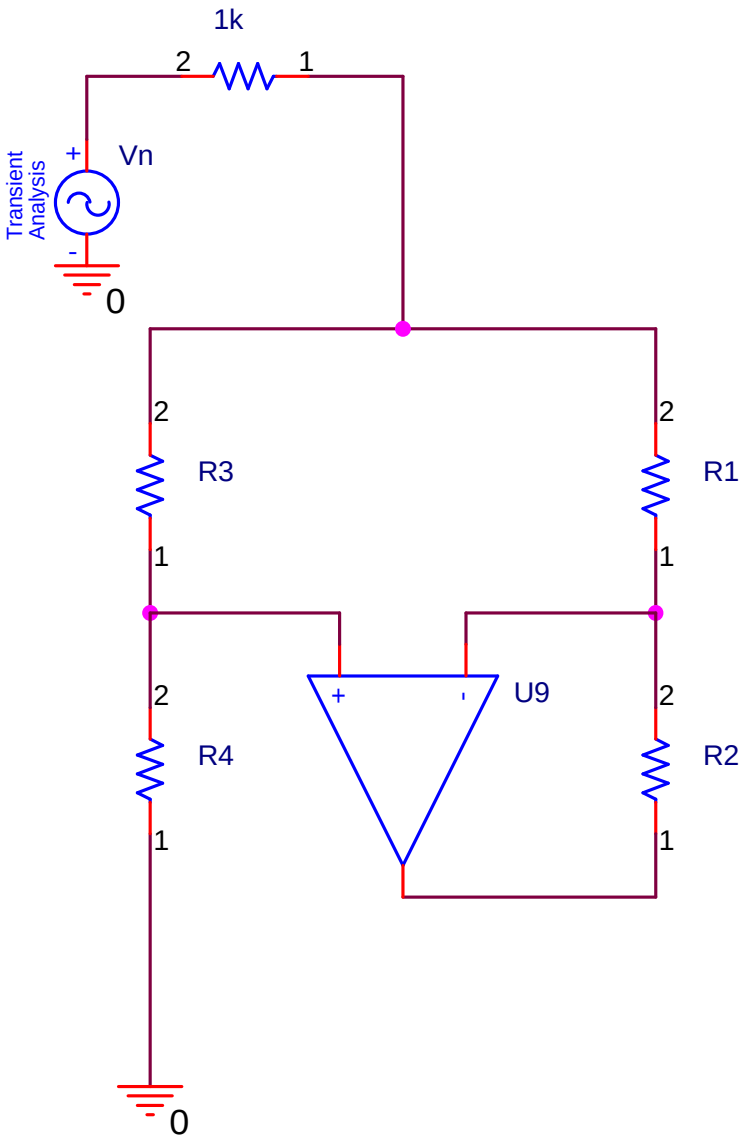
VSIN/CLASS

- The difference amplifier rejects noise (Interference Source) and amplifies a source (Microphone)
- Run a Time Domain (Transient) with three Voltage/Level Markers, and one pair of Voltage Differential Markers.
- Label each waveform and explain the shape and amplitude
- Why is the Microphone amplified, and the Interference suppressed?
- Change R1 to 15k and observe the waveforms, what is the circuit doing in this case?

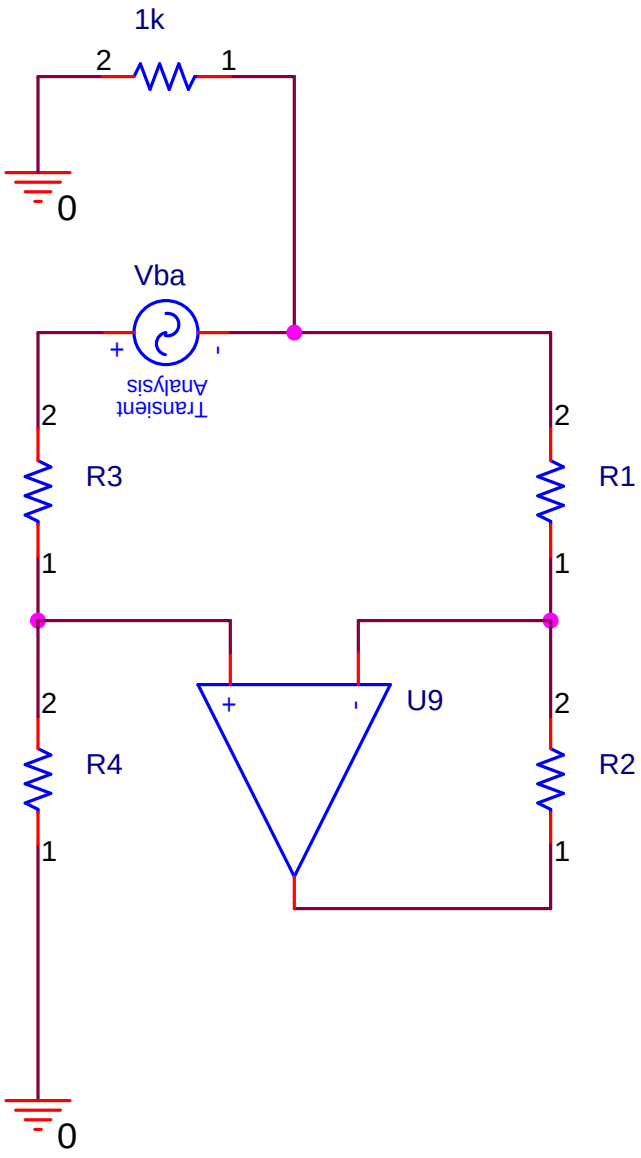
PSpice Tips

- To display more then one plot at a time: **Plot>Add Plot to Window**
- To move traces to different plots: Select the trace name on the current plot, type **CTRL C** (to copy), click on the new plot, and type **CTRL V** (to paste).
- To draw an arrow on the plot : **Plot>Label>Arrow**

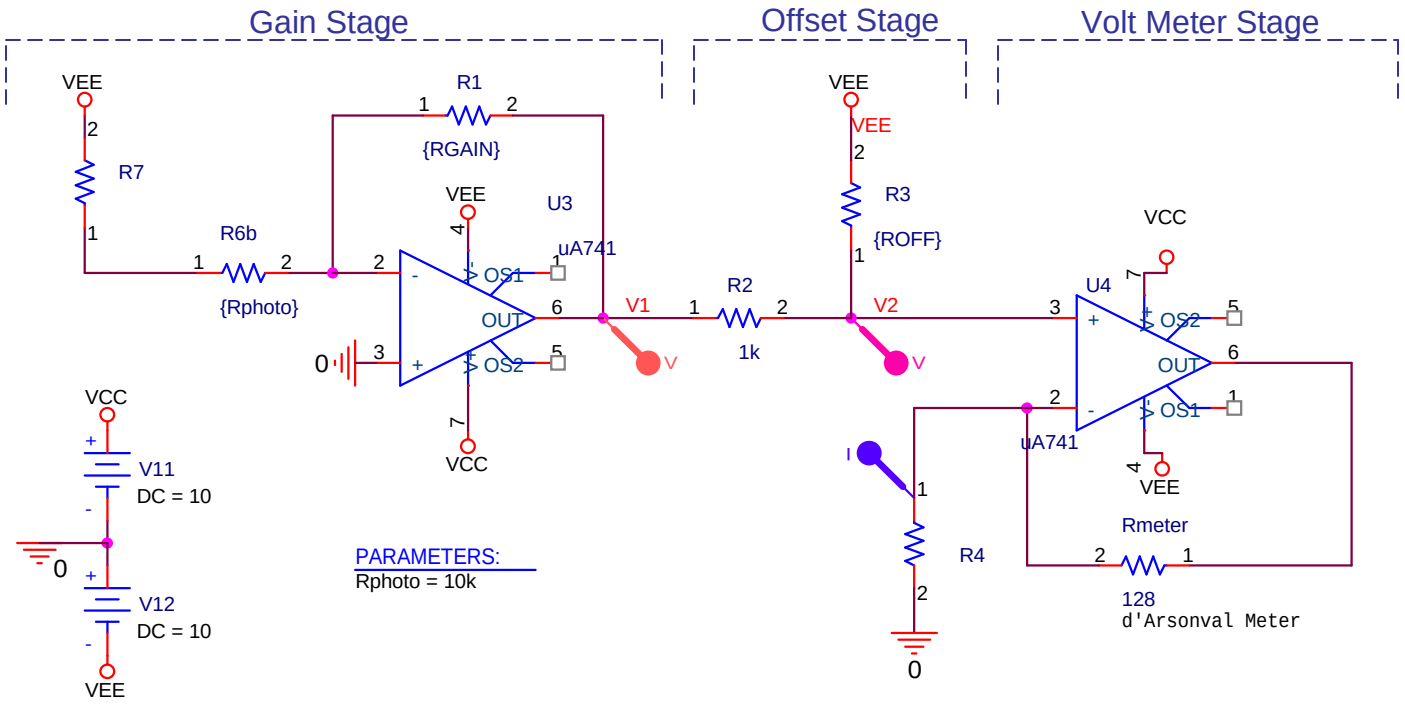
Why Does the Noise Cancel?



Why is V_{BA} Amplified?



PART 4: Light Meter



PSPICE:

Analysis Type:
DC Sweep

Global Parameter:
Rphoto

Sweep Type:
Logarithmic

Start Value: 100Ω

End Value: 10k Ω

Points/Decade: 50

Design Specs:

	Light	*Dark*
R_{PHOTO}	*400*	*10k*
V_2	*8V*	*0V*
Meter	*1*	*0*

- (Don't forget to answer this) What is the input resistance of the Volt Meter stage? Compare with the d'Arsonval voltmeter designed in lab 2.
- Follow the steps on page 6 of the Lab handout to design the light meter.
- Check the design with a DC sweep of R_{PHOTO} . Print one graph of v1 and v2 Vs. $R_{PHOTO,}$ and one graph of I_{METER} Vs. R_{PHOTO}