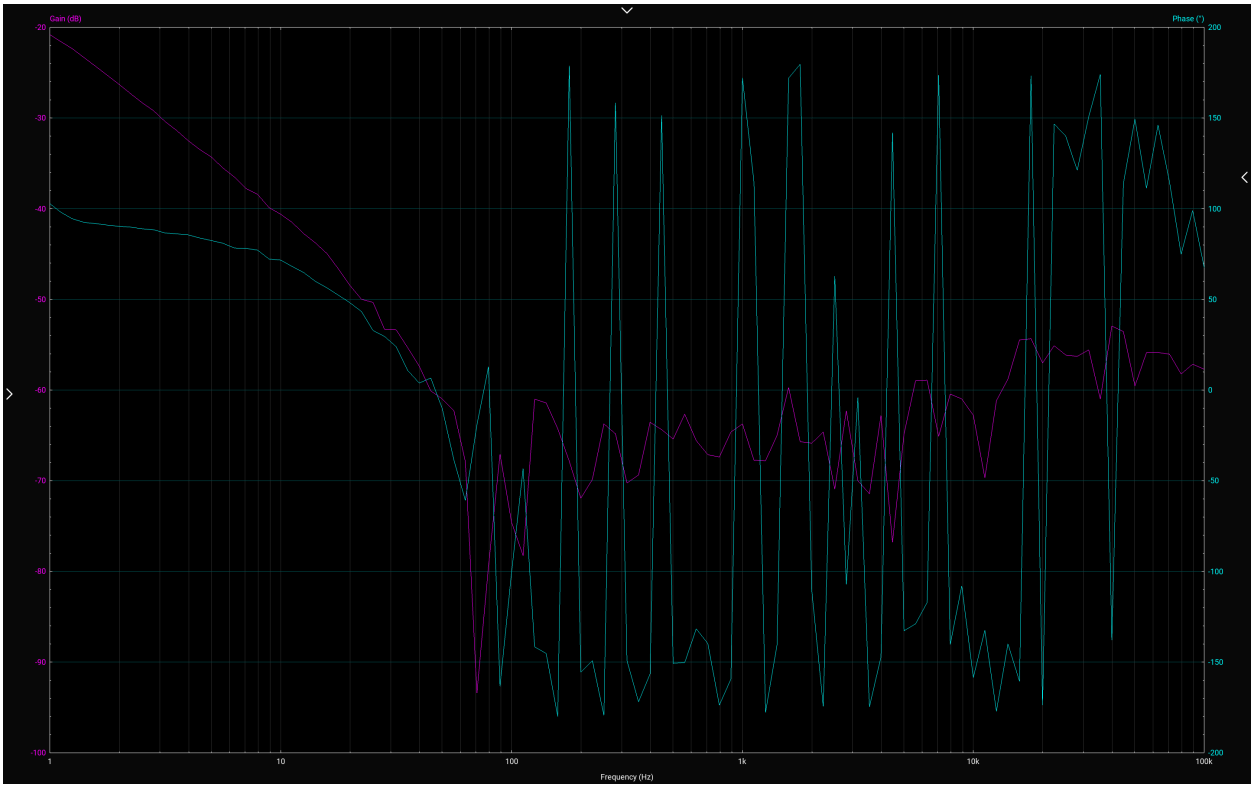
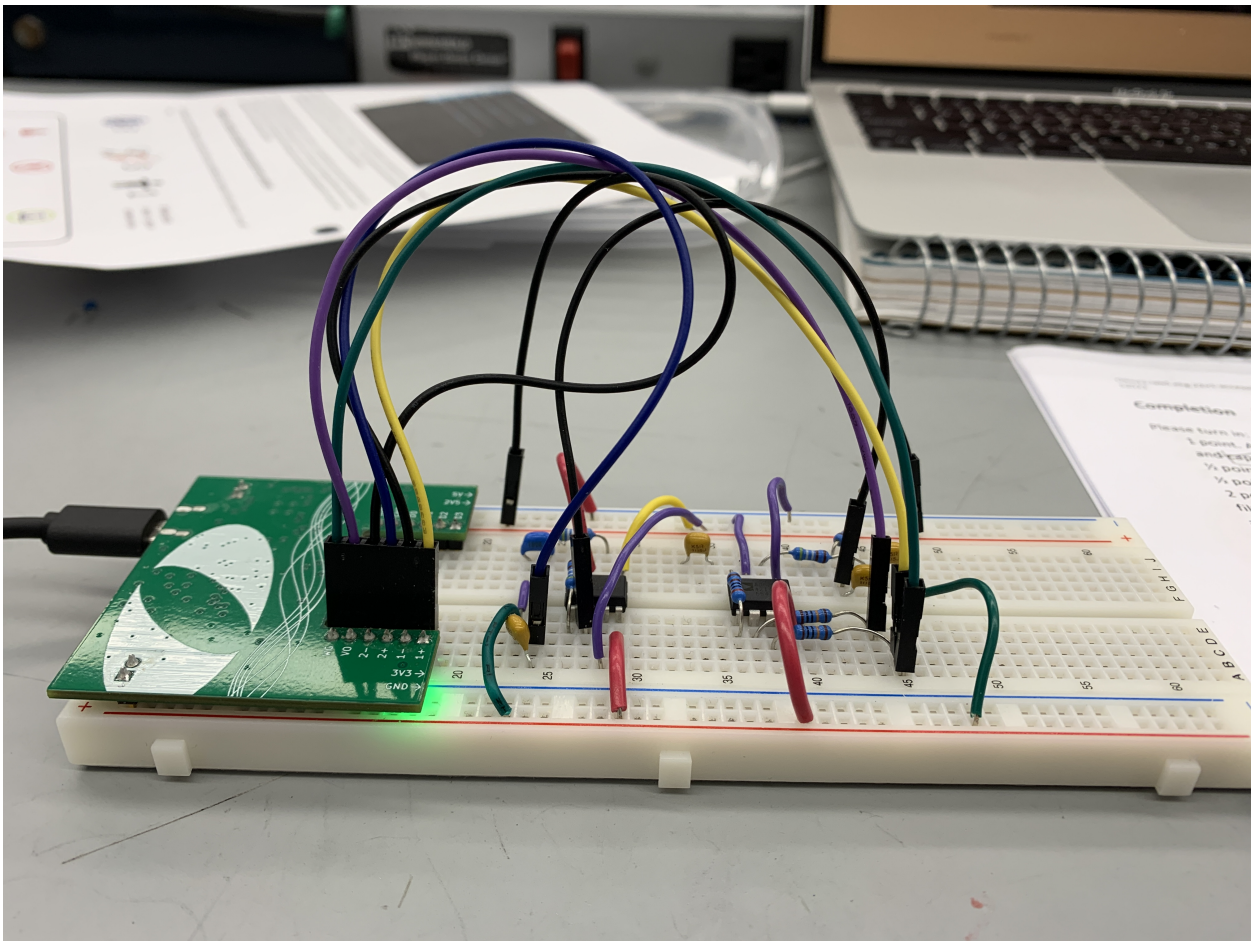
Lab 5

A Bode plot (Amplitude only)

Caption: This Bode Plot represents a low pass filter at a frequency beginning at 1 Hz. X-axis is labelled as Frequency in terms of Hz. Y-axis is in terms of dB where I used the amplitude formula to confirm the values (attached picture with my calculations and amplitude photo).

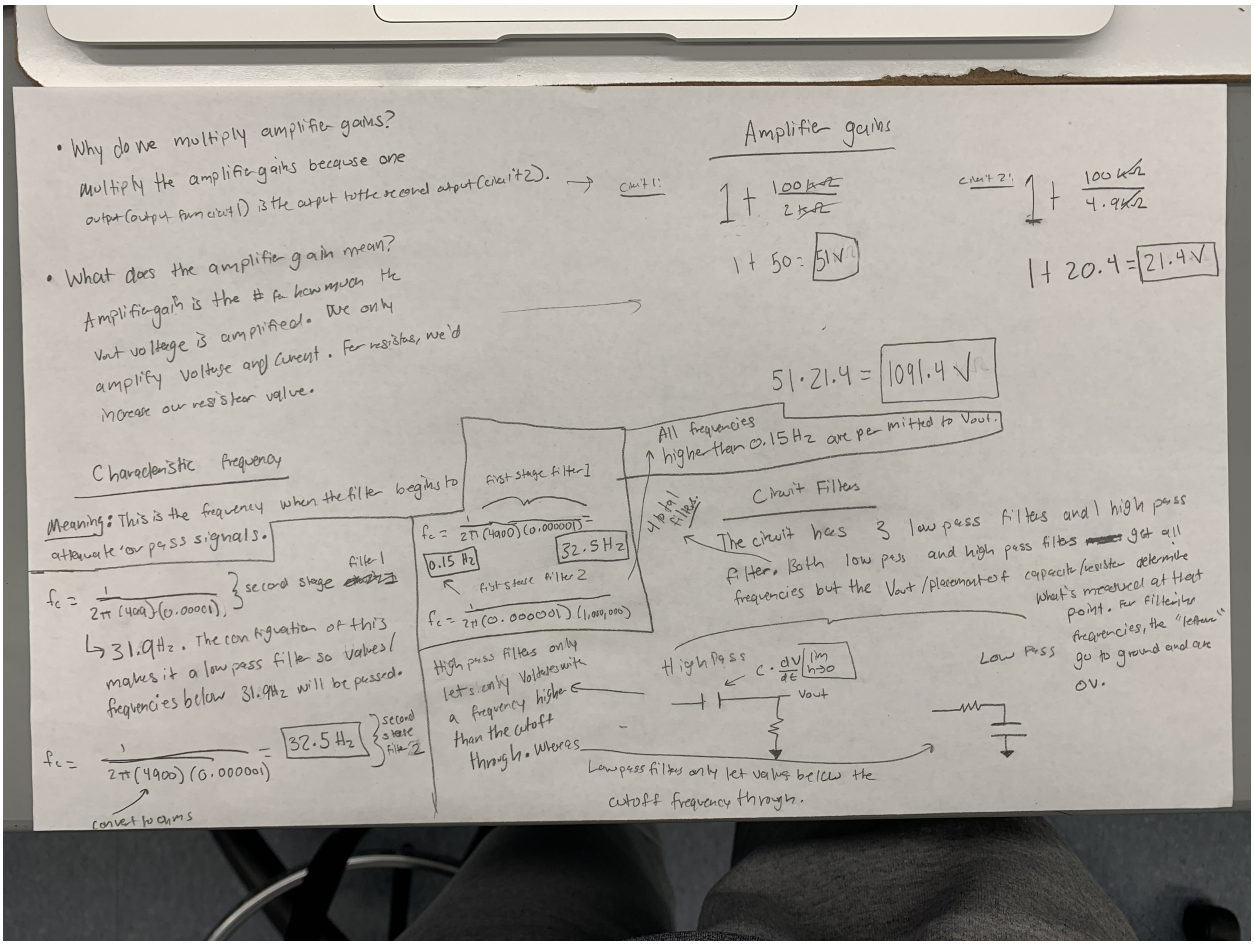


Picture of breadboard



Describe how the circuit functions

Included in photo: characteristic frequency calculation, amplifier gains (definitions and calculations), circuit filters (schematics and total filters).


• Why do we multiply amplifier gains?
multiply the amplifier gains because one output (output from circuit) is the output to the second output (circuit 2). → Circuit 1:
• What does the amplifier gain mean?
Amplifier gain is the # for how much the Vout voltage is amplified. We only amplify voltage and current. For resistor, we'd increase our resistor value.
Amplifier gains
1 + 100kΩ / 2kΩ
1 + 50 = 51V
Circuit 2:
1 + 100kΩ / 4.9kΩ
1 + 20.4 = 21.4V
51 · 21.4 = 1091.4V
All frequencies higher than 0.15Hz are permitted to Vout.
Characteristic frequency
Meaning: This is the frequency when the filter begins to attenuate or pass signals.
first stage filter
$f_c = \frac{1}{2\pi(4900)(0.000001)}$
32.5Hz
0.15Hz
first stage filter 2
$f_c = \frac{1}{2\pi(0.000001)(1,000,000)}$
$f_c = \frac{1}{2\pi(4900)(0.00001)}$ } second stage filter 1
↳ 31.9Hz. The configuration of this makes it a low pass filter so values/frequencies below 31.9Hz will be passed.
$f_c = \frac{1}{2\pi(4900)(0.000001)} = 32.5Hz$ } second stage filter 2
convert to ohms
high pass filters only lets through voltages with a frequency higher than the cutoff through. Whereas
Low pass filters only let values below the cutoff frequency through.
Circuit Filters
The circuit has 3 low pass filters and 1 high pass filter. Both low pass and high pass filters get all frequencies but the Vout/placement of capacitor/resistor determine what's measured at that point. For filtering frequencies, the "feature" go to ground and are 0V.
High Pass
$C \cdot \frac{dV}{dt} \left| \frac{Im}{h30} \right.$
Vout
Low Pass