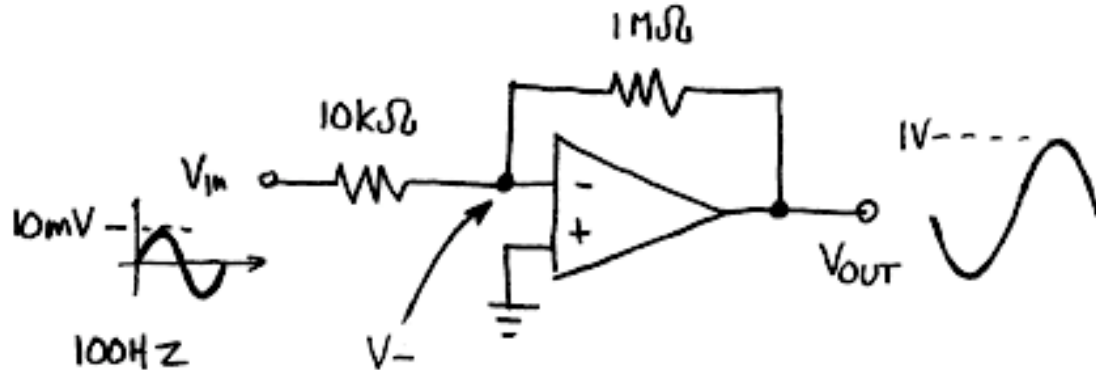


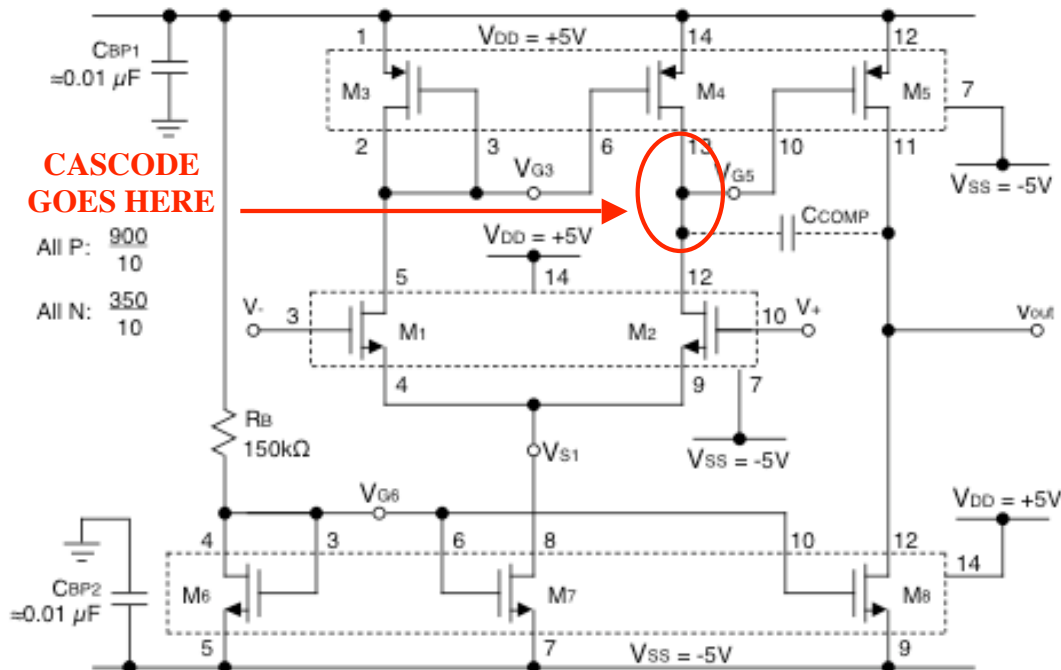
CASCODE OP-AMP

Start with your previous op-amp, compensated. Hook it up for an inverting gain of 100. Use a 10mV input sine wave at 100Hz to get an output swing of around 1V.

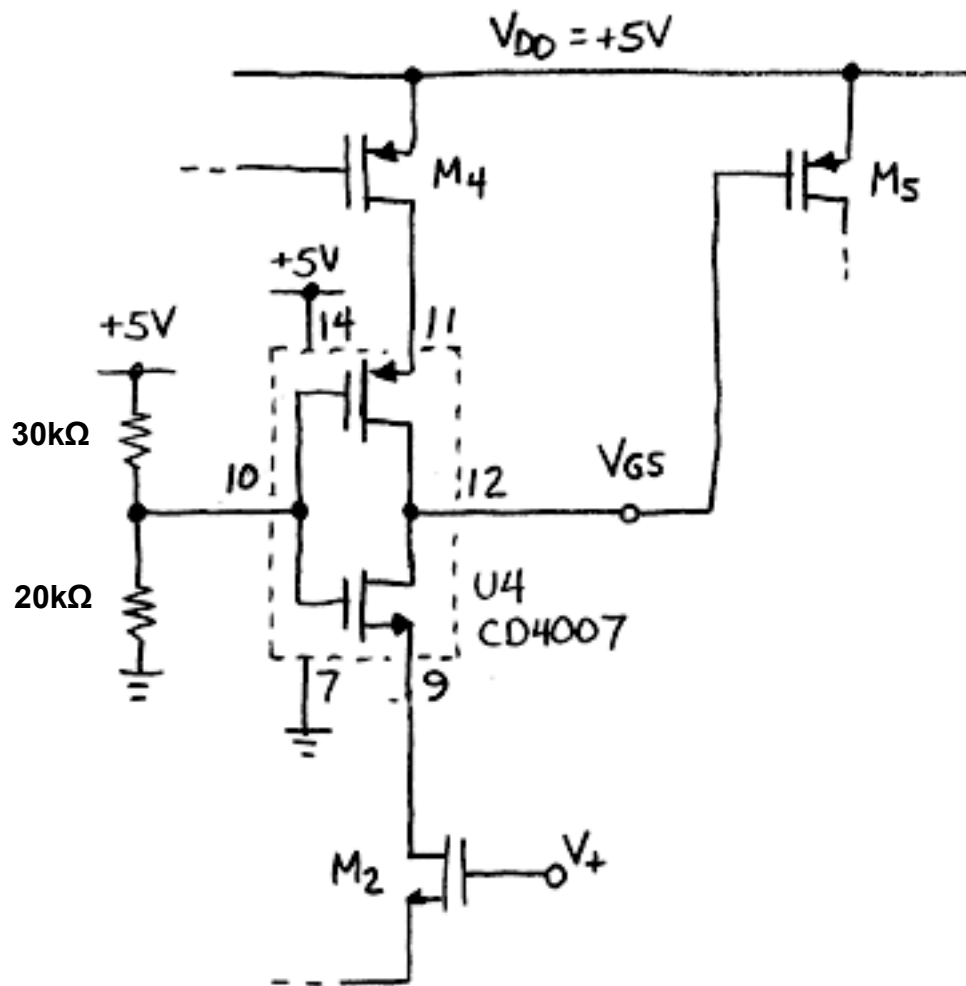


The nice thing about doing it this way is you can look directly at the signal at the - input, which is close to ground, and view it up close on the scope: since there's no DC component, expanding to the max scale will not shoot the signal off the screen.

Without the cascode, your open loop gain of about 1000 should give a 1mV sine wave at the - input. With the scope probe on 1X and the scope on 2mV/division, you should be able to (barely) see a signal at the - input. Record the signal amplitude as best you can, then do the cascode as indicated below:



To cascode the internal node, you'll need a fourth CD4007 chip. Connect it as shown here:



Now when you operate the op-amp, you should see a much smaller signal amplitude at the - input, corresponding to a larger open-loop gain (same output swing for a smaller input swing). the signal swing at the - input will probably be too small for you to actually calculate a gain - just verifying that gain is improved is good enough.

Note: the values in the $30\text{k}\Omega$ / $20\text{k}\Omega$ voltage divider were chosen to set the bias rail for the cascoding devices so that all devices were in the active region. For your device parameters, it may be necessary to adjust the voltage somewhat, You can always probe the DC bias levels to establish that all devices are in the active region.