Reverse Classroom: Op Amps Quiz 3

REV 0; August 18, 2019

1 Inverting Op Amp Configuration

Just a reminder:

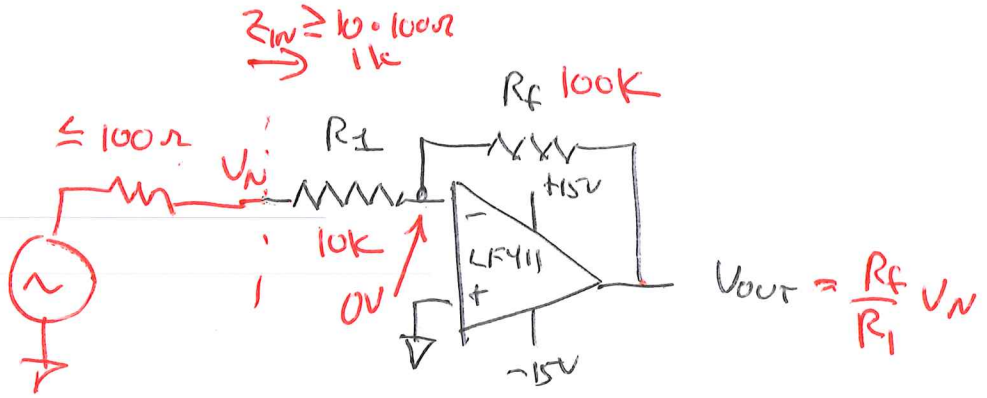
Perfect Op Amp Design Rules

1. No current flows into or out of the inputs (V_- and V_+) of an op amp.
2. If there is negative feedback, the op amp keeps the negative input at the same voltage as the positive input, so you can assume that $V_- = V_+$.
3. The inputs of an op amp should always be kept between V_{CC} and V_{EE} (i.e., $V_{EE} \leq V_-, V_+ \leq V_{CC}$).
4. The output of an op amp cannot be greater than V_{CC} or less than V_{EE}.

1.1 Design

Apply the Golden Rules to design an inverting amplifier using an LF411 op amp. Use standard value resistors. Here are the specifications:

- gain of ≈ -10 (i.e., a gain of ≈ 10 and a phase shift of 180 degrees) $-\frac{100k}{10k} = -10$
- R_{out} for the signal source is $\leq 100\Omega$ $Z_{IN} = 10k$
- use supplies of ± 15V



1.2 Amplifier Input Impedance

What is the input impedance of your amplifier according to the golden rules?

R_1 ($\approx$ 10k)

1.3 Amplifier Output Impedance

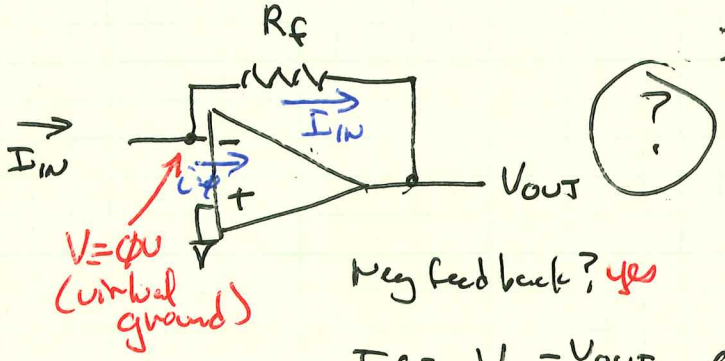
What is the approximate output impedance of your amplifier?

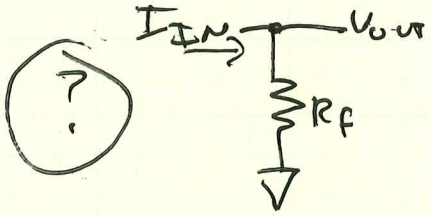
$\approx \phi.5\Omega$

Now complete Lab 6 through part 6L.7

MORE OP AMP CIRCUITS

PART IV
PAGE 1





Neg feedback? yes

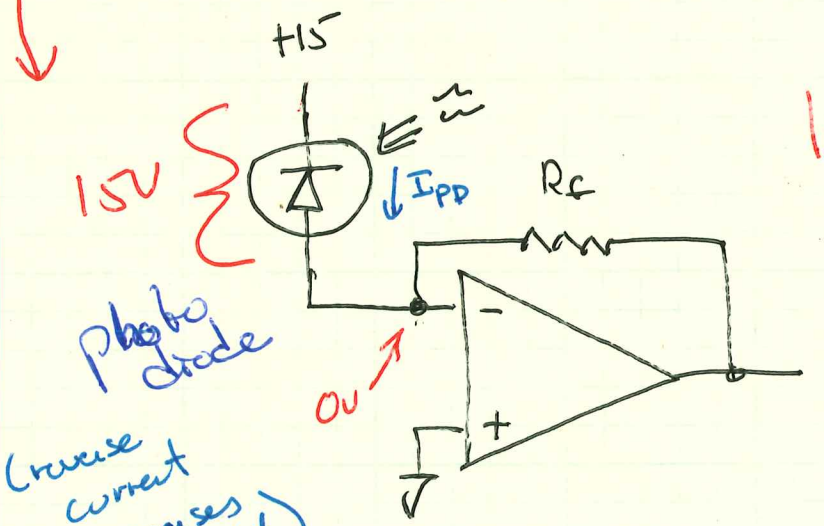
$$I_f = \frac{V_- - V_{OUT}}{R_f} = \frac{0V - V_{OUT}}{R_F}$$

$$I_{IN} = I_f = -\frac{V_{OUT}}{R_F}$$

$$V_{OUT} = -I_{IN} \cdot R_F$$

inverting current to voltage converter

used here



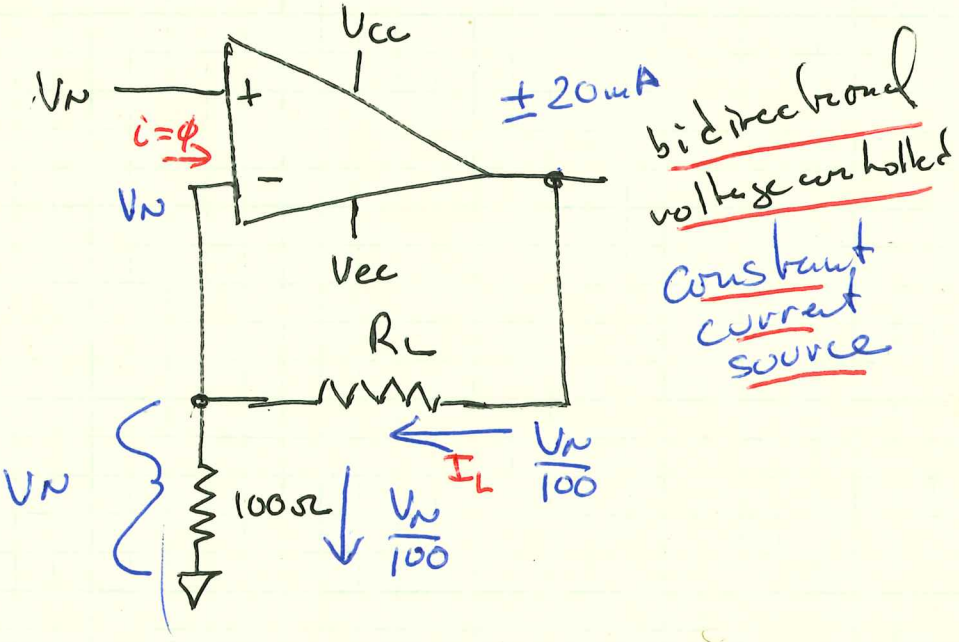
light detector

$V_{OUT} = \phi$ dark
$< \phi$ light

(reverse current increases w/ light)

$$V_{OUT} = -I_{PD} \cdot R_f$$

sets gain

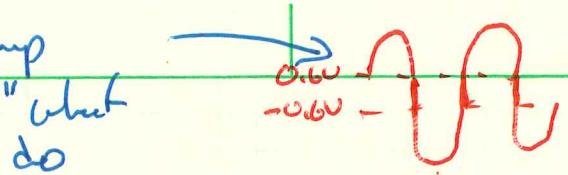


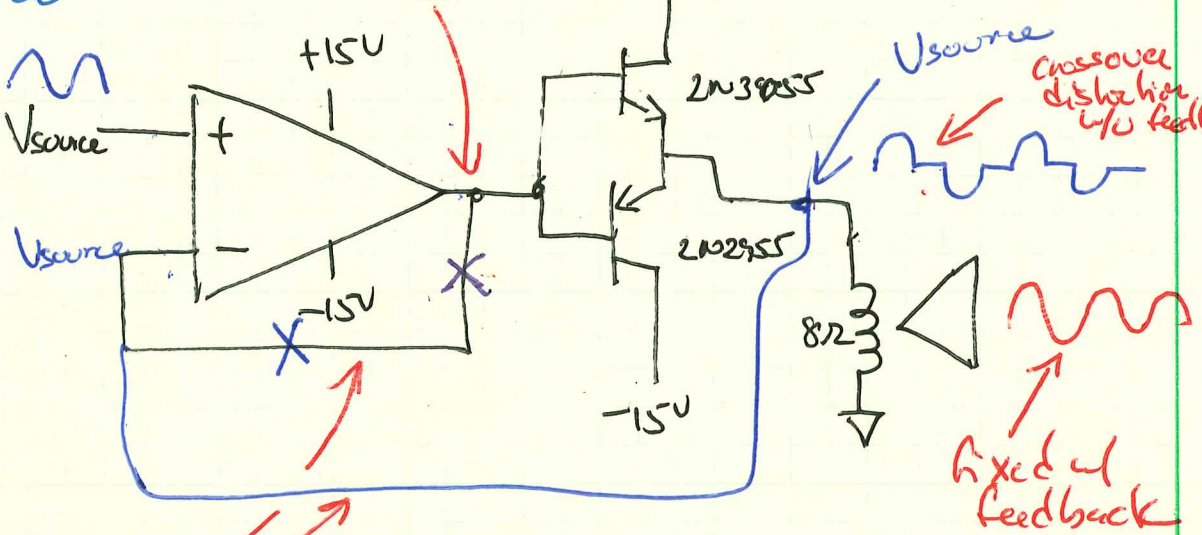
$$R_L \leq \frac{V_{cc} - V_N}{\text{max } I_L \text{ desired}}$$

we are limited to max output current of op amp (±10mA to ±20mA depending on op amp used)

to get more current or use a grounded load w/ i can add a BJT - see book

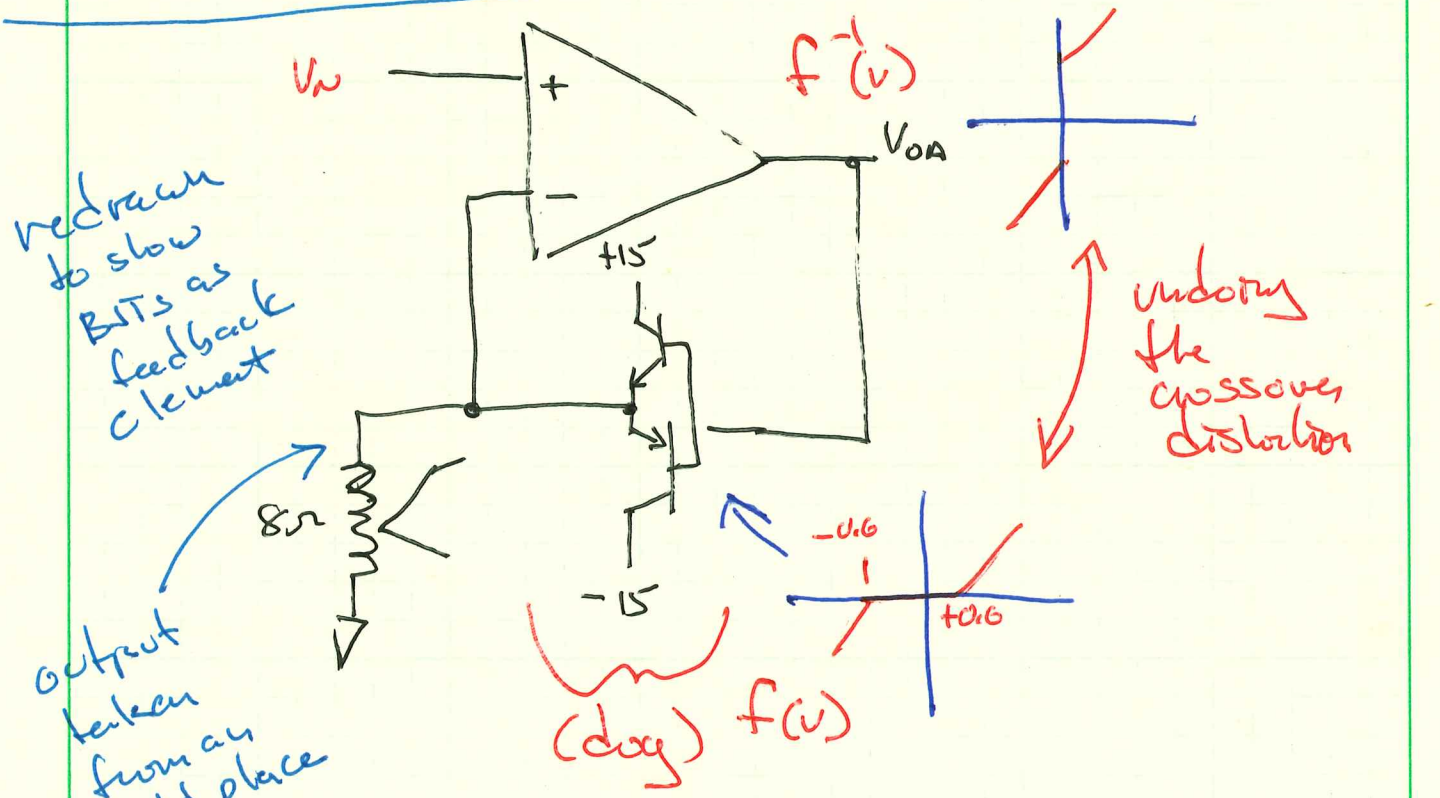
"op amp "undoes" what BJTs do





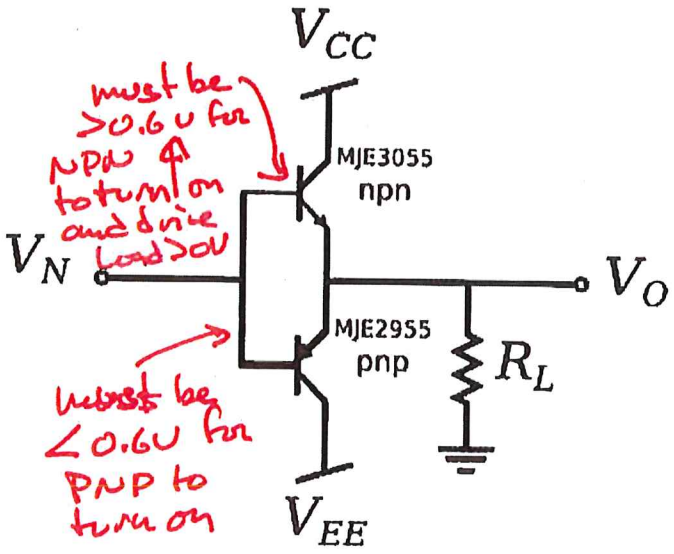
move feedback to eliminate crossover distortion

key feedback ✓

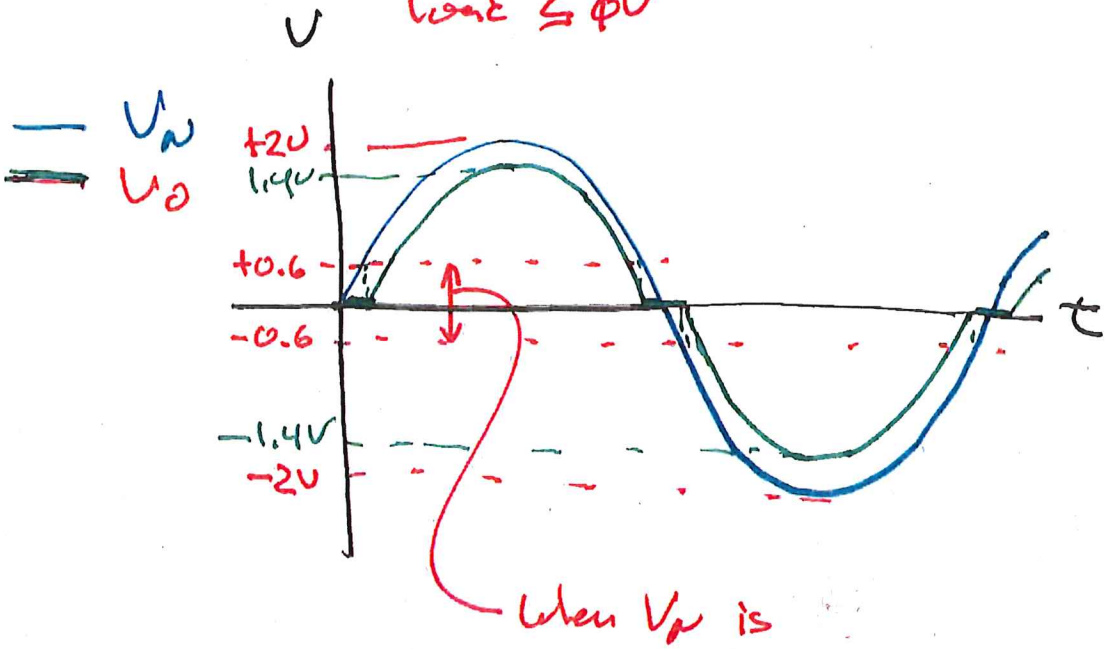


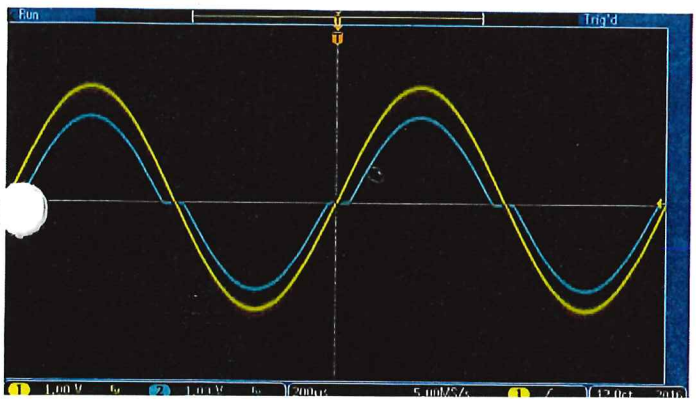
DEMONSTRATION

Class B Amplifier

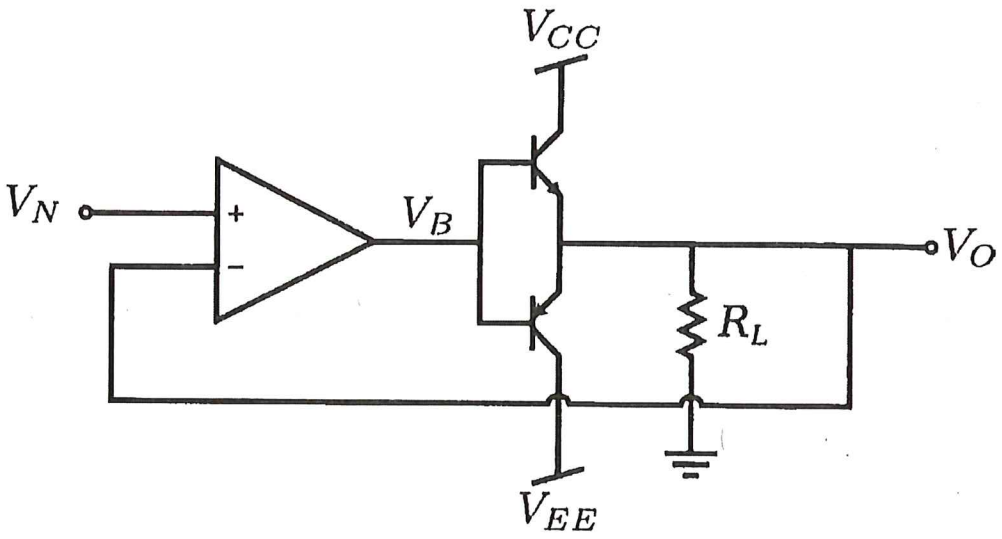


aka push-pull amplifier
and drive load ≤ 8Ω





Class B with Feedback



feedback fixes everything

Now the op amp compensates for dead zone

The purple trace is the output of the op amp undoing the crossover distortion of the push pull BJT pair.