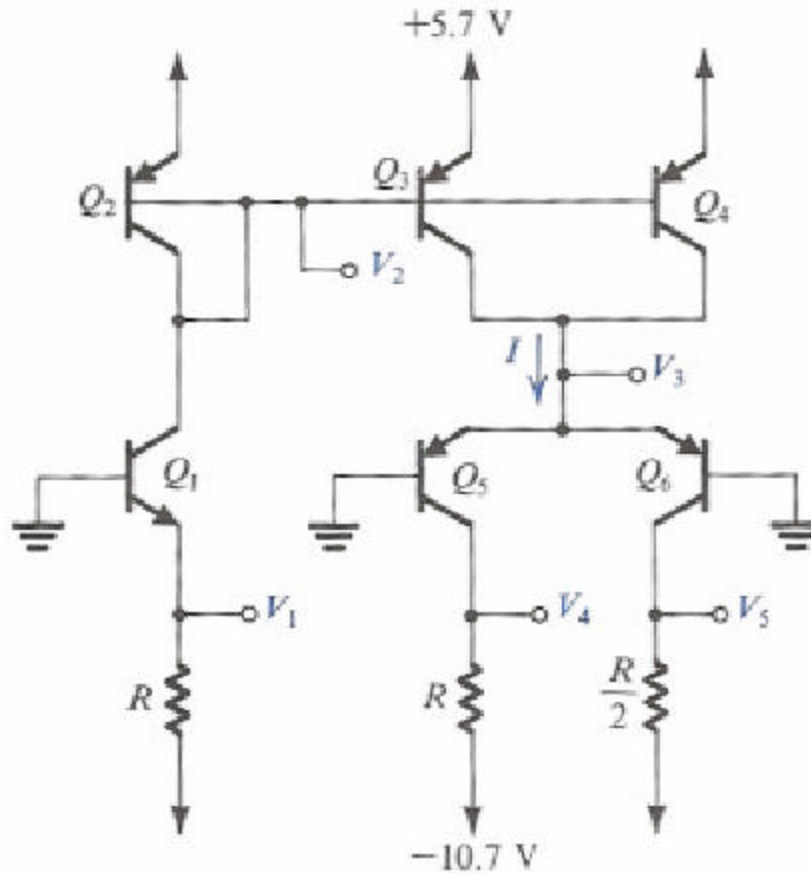


MOS DIFFERENTIAL

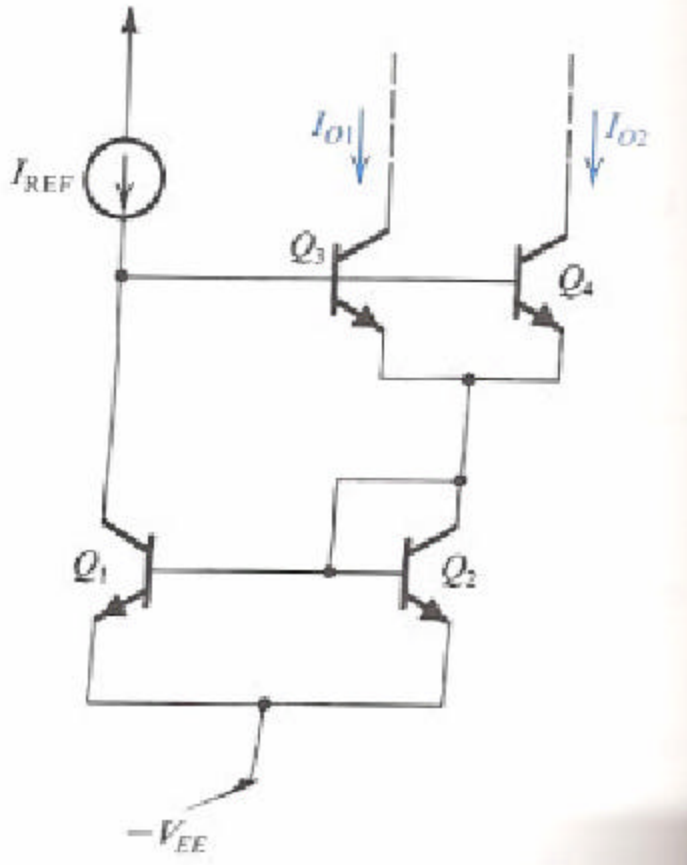
Examples:

6.35 $|V_{BE}| = 0.7$, $\beta = \infty$, $R = 10\text{k}\Omega$

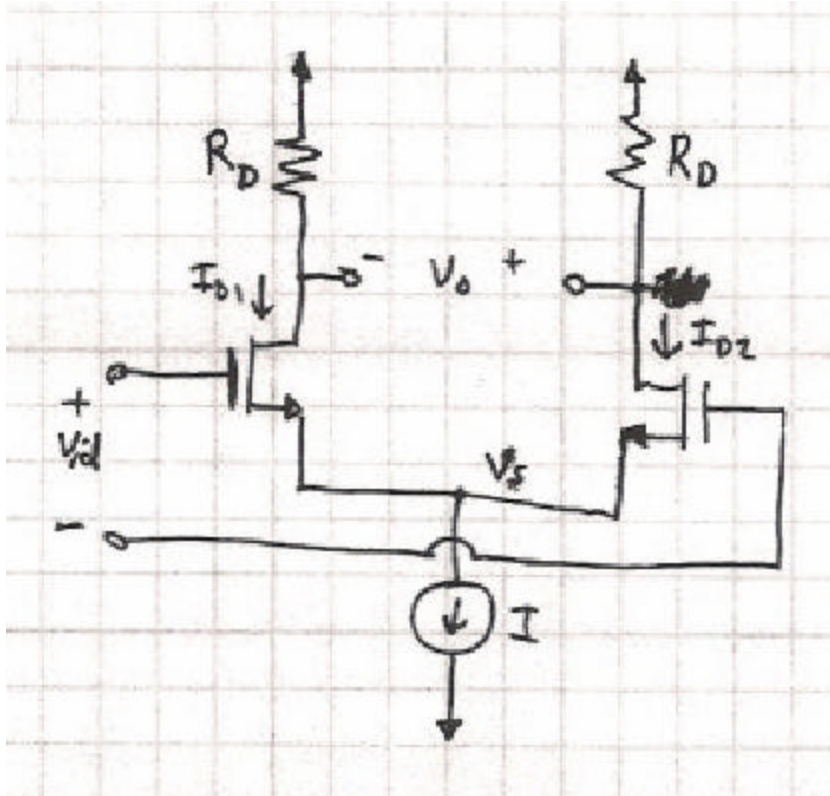


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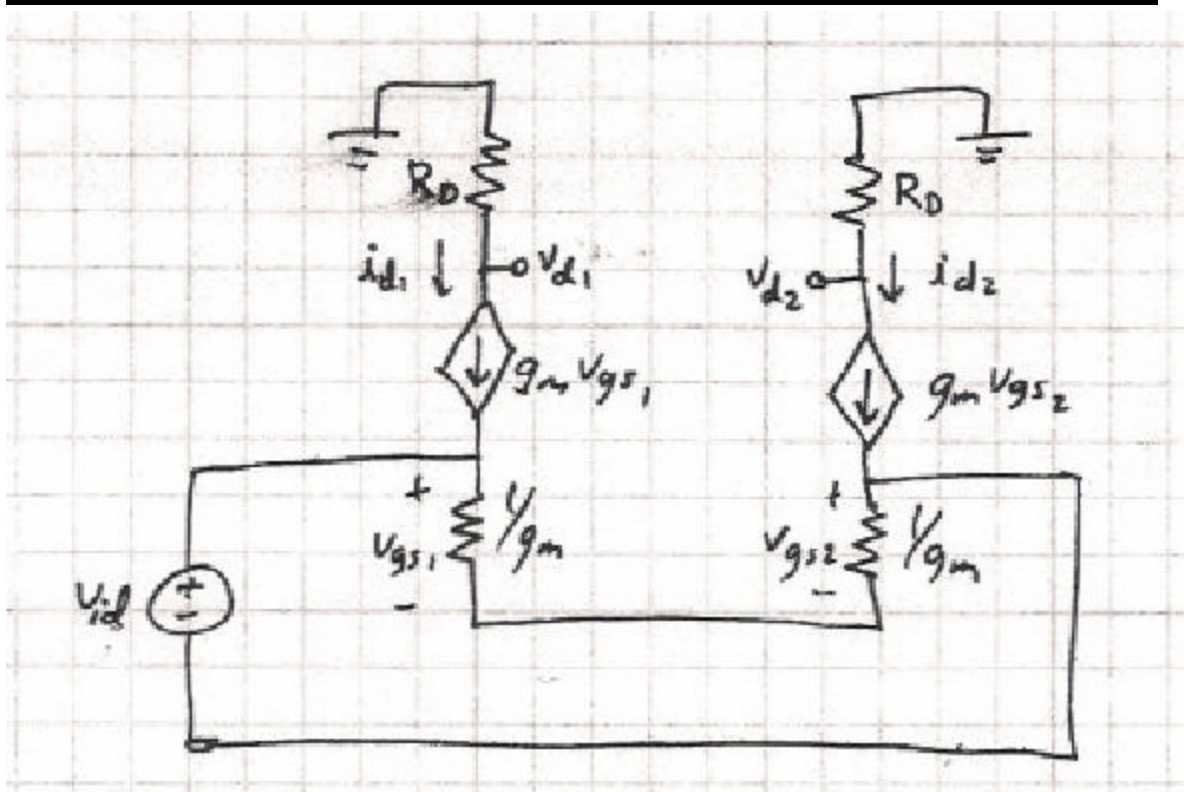
6.134 A modified Wilson current mirror. Find I_{O1} and I_{O2} in terms of I_{REF} . Assume matched β for all transistors. Redesign to generate currents of 1mA, 2mA, and 4mA with a reference of 7mA. What is $\beta=50$?



MOS DIFFERENTIAL

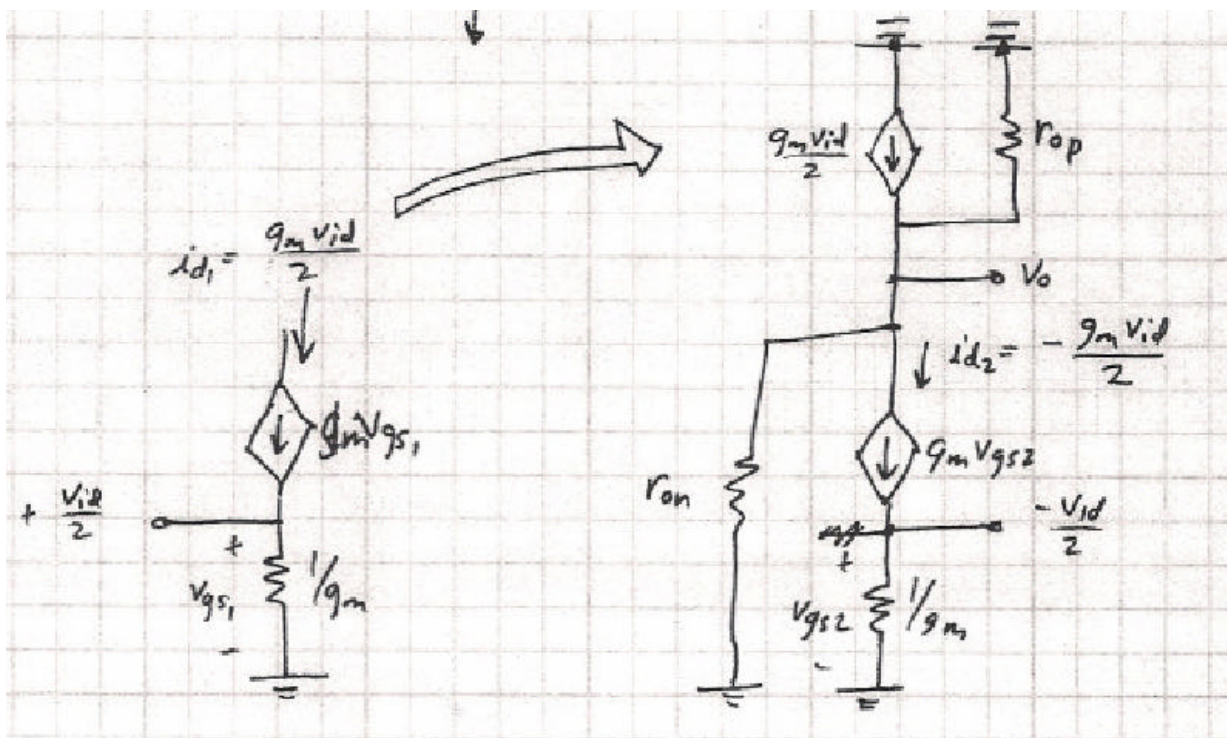
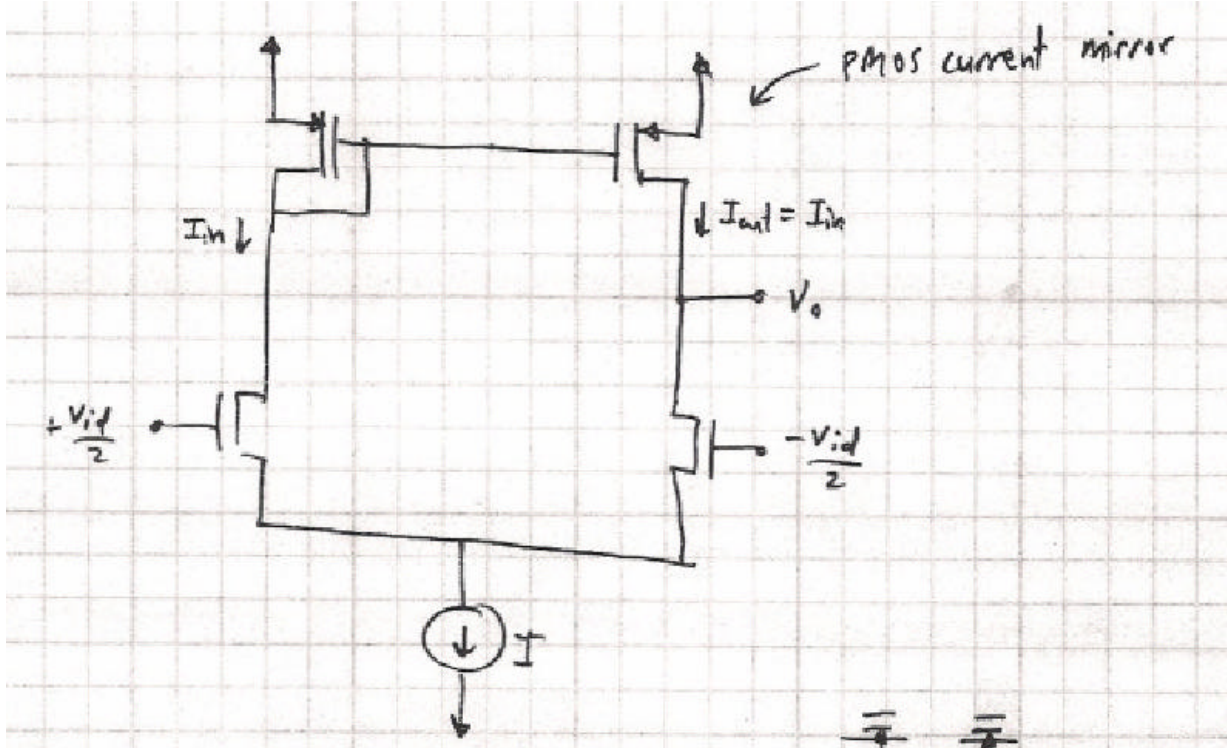


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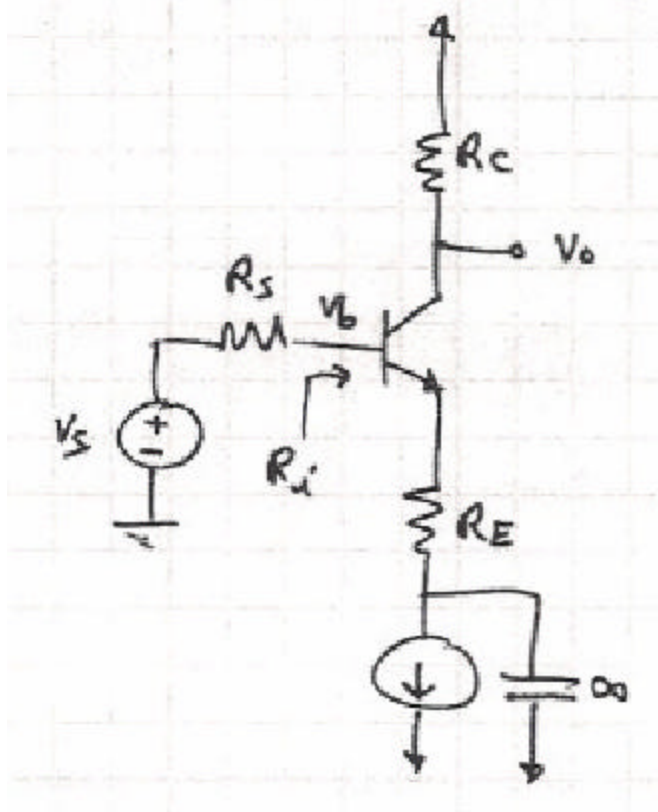
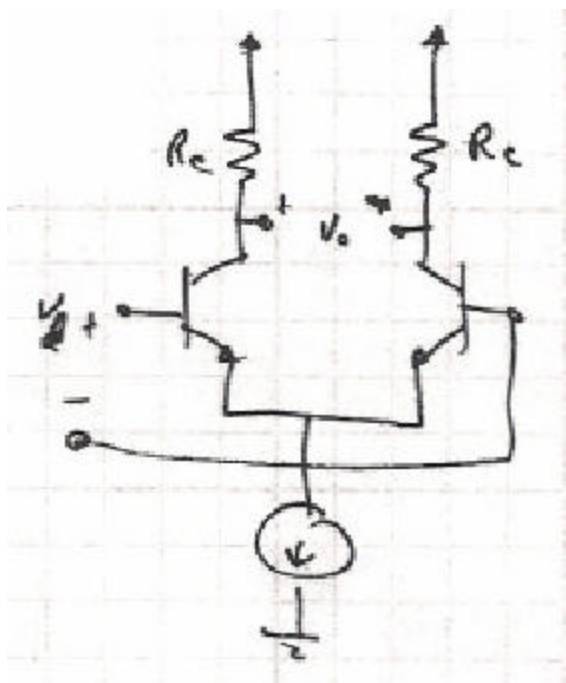


MOS DIFFERENTIAL

Active Loads

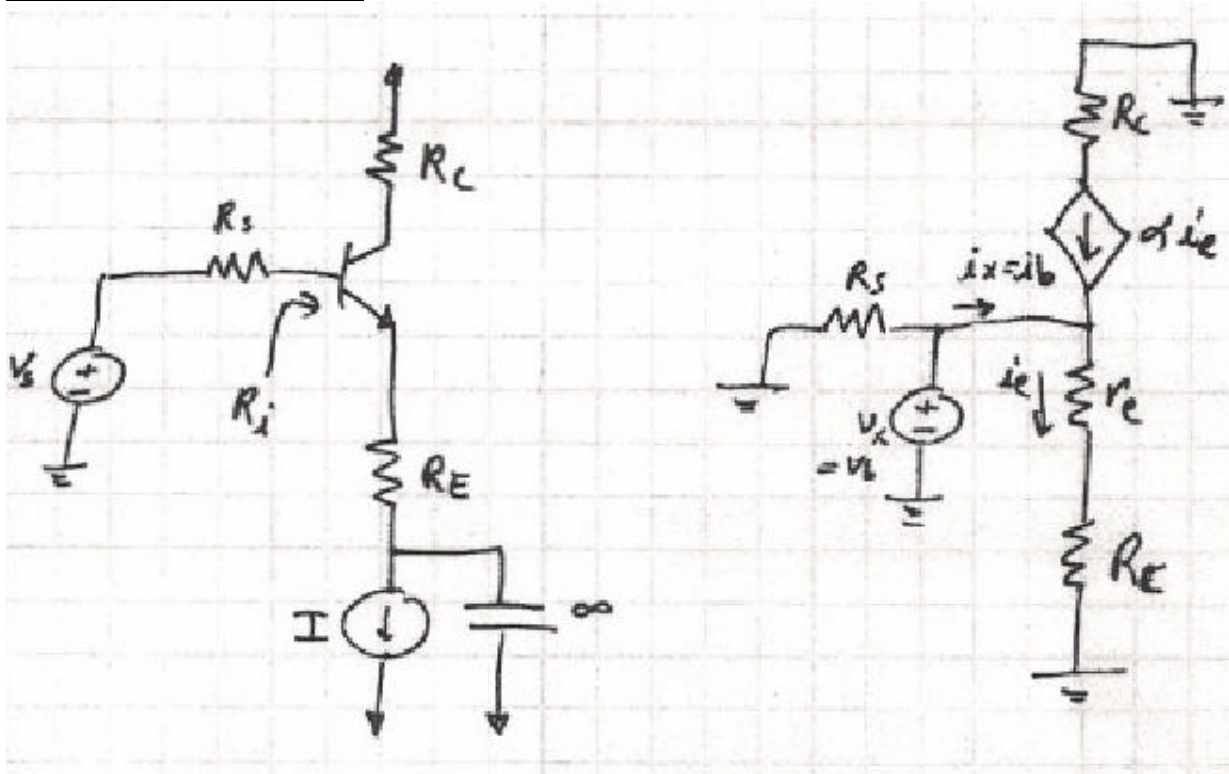


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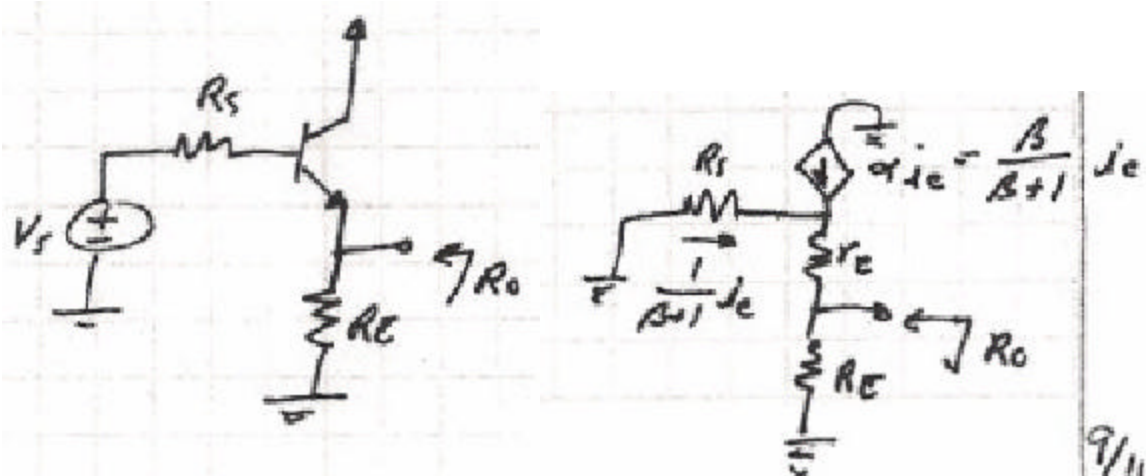


MOS DIFFERENTIAL

Resistance-reflection rule:

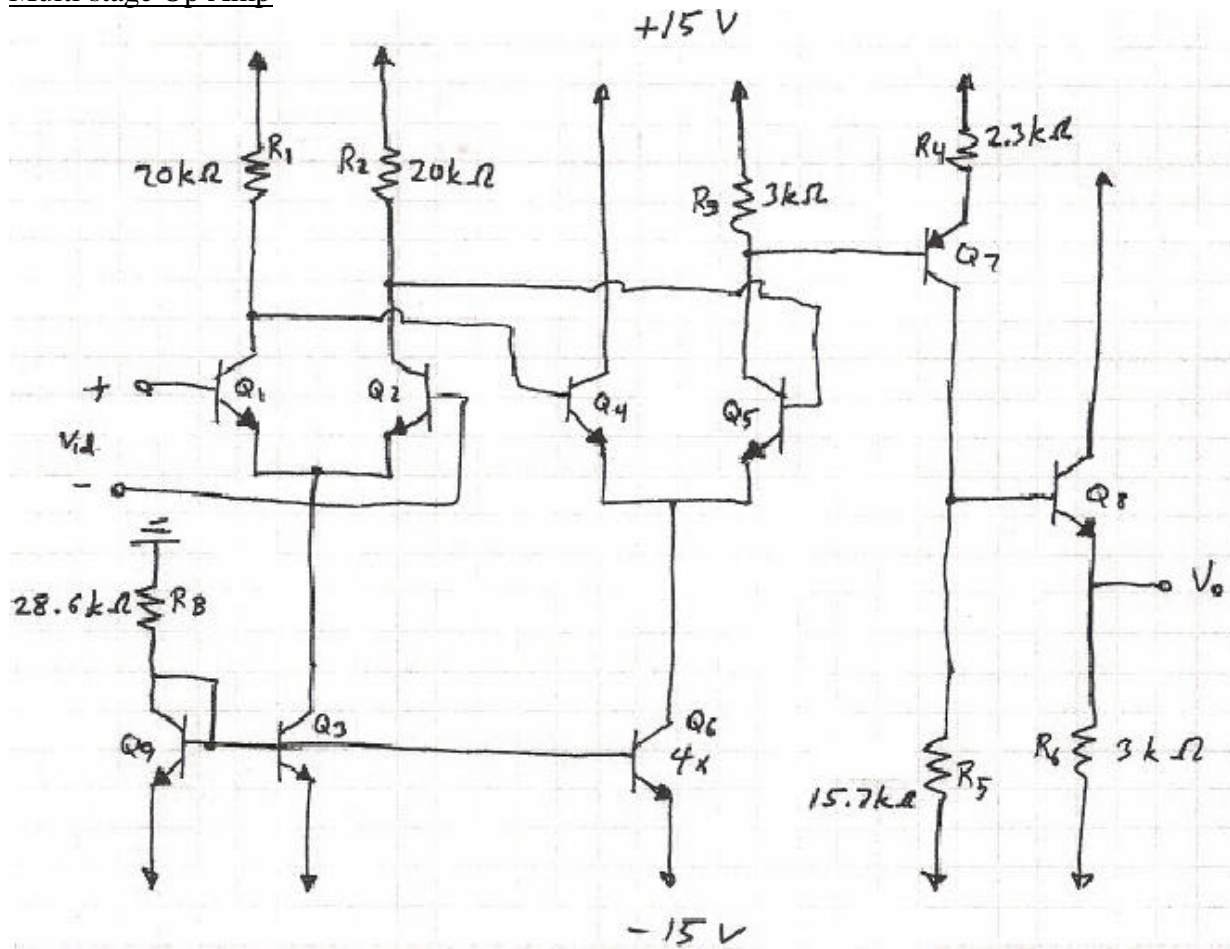


MOS DIFFERENTIAL



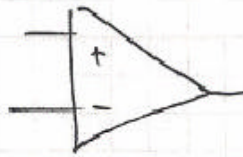
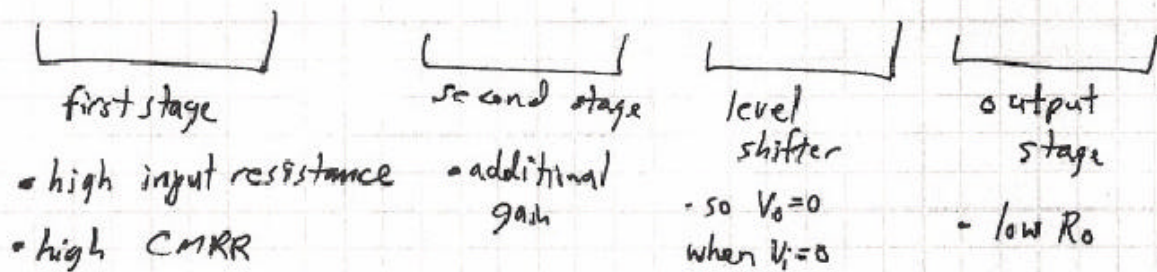
MOS DIFFERENTIAL

Multi-stage Op Amp



MOS DIFFERENTIAL

General Design of Multi-stage Op-amps:



We've built an op-amp!

... Not quite yet. If we used this amp in a feedback configuration, it would oscillate.

Why?