

Midterm Friday 1:10-2:30 2 pages 4 sides notes
OH today 2-3

You can now solve real world problems w/ IC amplifiers!

I need an amplifier!

what gain? $\Rightarrow f$ what gain accuracy? $\Rightarrow A_f > x$

what $3V$? what load (R_L)? $\Rightarrow$ sets v_{in}

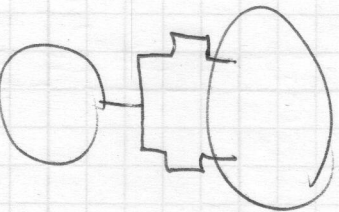
what input/output range? $\Rightarrow$ constant band currents $\Rightarrow$ sets V_{ov} in most devices

what supply voltage? temperature range?

Diff Amp

- common mode & differential gain w/

different local & tail configurations



Common theros

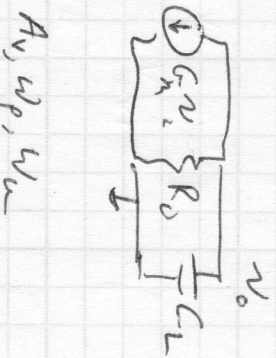
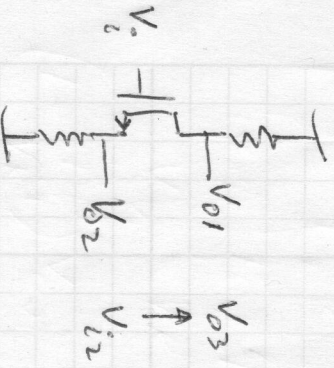
- tail $\sim \frac{V_{icm}}{R_{tail}}$

- look for symmetry

- G_m, R_o always works

- input CM range, output swing plot.

Basics G_m, R_o

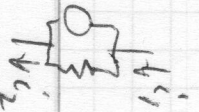


A_v, v_{op}, v_{in}

- draw small signal model

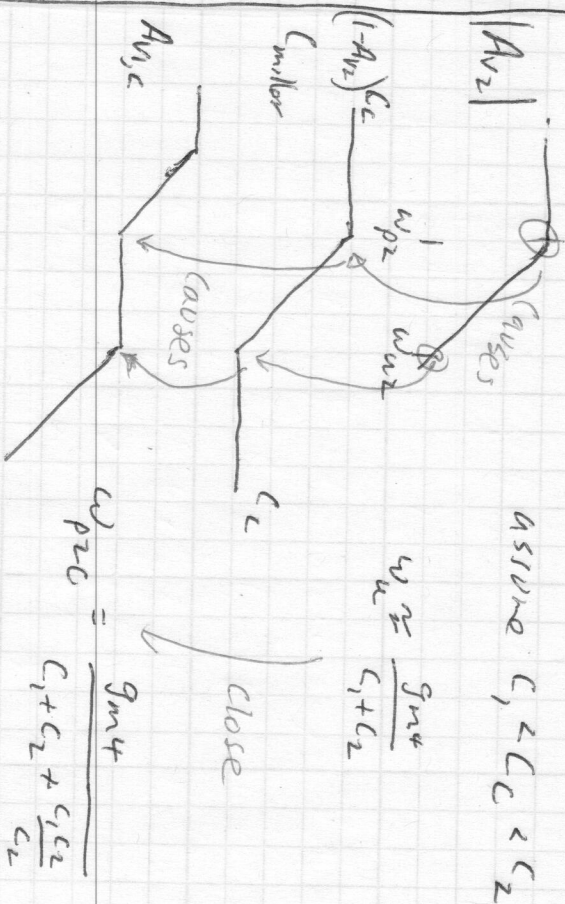
- use KCL

- look for currents that must be equal



2 Stage op-amp

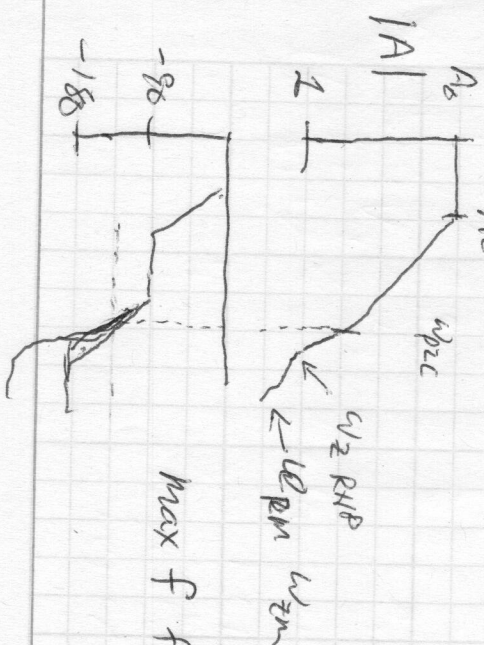
- Examples in other technologies
 - bias point + device sizing
 - Input CM range, output swing
 - freq response, phase margin, stability
 - Compensation C_1, C_2 , and C_c
- Bode plot of A_{v2}, A_{v1c}



Phase margin & stability: stay away from $\angle A(j\omega) = -1$

want $\angle A(j\omega) f$ far away from -180

when $|A(j\omega) f| = 1$



12HP zero

current pulled from v_{b1}

