

Lecture 1: Admin & Overview

- Announcements:
- EE 140/240A: Analog Integrated Circuits
- Instructor: Prof. Clark T.-C. Nguyen
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- Go though
  - ↳ Course information sheet
  - ↳ Syllabus
  - ↳ Grading Information and Policy
- Hand out class account sheets
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- For the course website, just google ee140
  - ↳ The website should be up and running in a couple of days
- EE 140 screencast previously
  - ↳ If you miss a lecture ...
  - ↳ Can view previous year lectures at either <http://itunes.berkeley.edu/> or <http://www.youtube.com/ucberkeley>
- But that there'll be some differences this semester
  - ↳ This course now "contains" EE 240A
  - ↳ EE 240A same as 140, but with additional material for graduate students, mainly MEng
  - ↳ Additional homework problems
  - ↳ Additional project specs, or different project altogether
- This course also supports the new MAS-IC program
  - ↳ MAS-IC: a new "remote" degree
  - ↳ Pro: more professional recording
  - ↳ Con: need to put up with "hollywood-like" logistics

↳ Con: recordings might not be available publicly

- Office Hour Changes?: Nguyen Wed → 1-2 p.m.
- Discussion sections start next week

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• Last Time:

- Review of bipolar transistors by your TA
- I'm here today, of course
- But I will be traveling again next Tuesday, so another of your TA's will lecture on MOS transistor design

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• Lecture Topics:

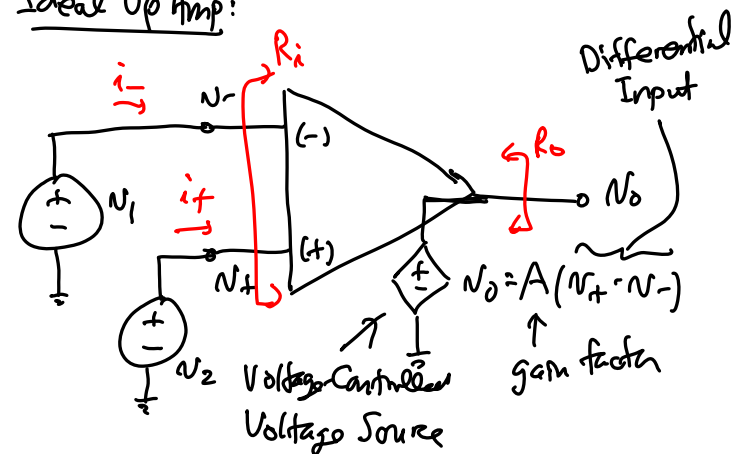
↳ Review

- Ideal Op Amps
- Non-Ideal Op Amps
- Op Amp Examples

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Review of Op Amp

Ideal Op Amp:



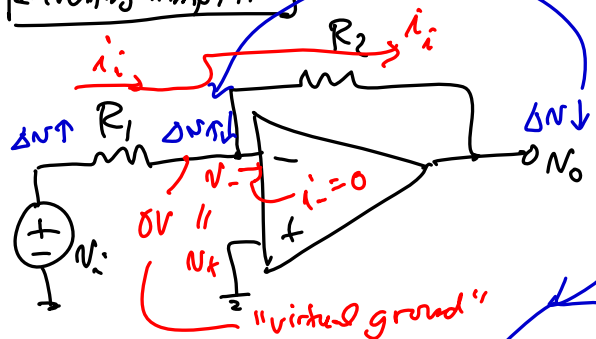
### Properties of Op Amps

- ①  $A \rightarrow \infty \rightarrow V_+ = V_-$
- ②  $R_i \rightarrow \infty \rightarrow i_+ = i_- = 0$
- ③  $R_o = 0$
- ④ Infinite Bandwidth

$$V_o = A(V_+ - V_-)$$

$\uparrow$     $\uparrow$     $\uparrow$   
 finite    $\infty$    0

### Inverting Amplifier



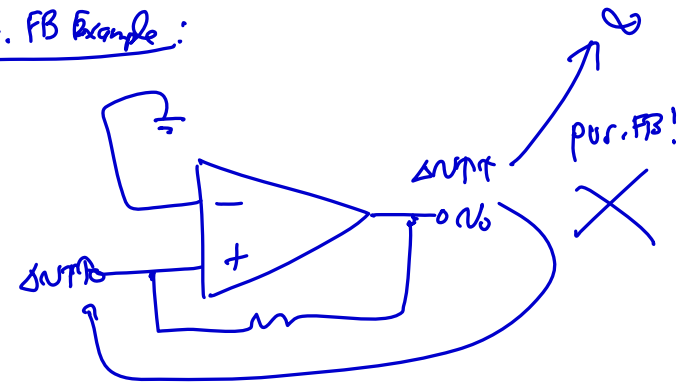
connects  $\Delta V$   
@ input  
 $\therefore$  neg. FB!

① Verify that we have (-) FB.

②  $\therefore V_o = \text{finite} \rightarrow V_+ = V_-$

$$i_i = \frac{V_i - 0}{R_1} = \frac{V_i}{R_1} \quad V_o = 0 - i_i R_2 \rightarrow *$$

### Pos. FB Example:



$$* \rightarrow V_o = -\frac{V_i}{R_1} R_2 \rightarrow \boxed{\frac{V_o}{V_i} = -\frac{R_2}{R_1}}$$