

## *Lecture 23 -- Op-Amp Design*

Draw a cartoon schematic for a 3-stage op-amp with a level shift. What op-amp property is each stage responsible for?

How does the need to be DC coupled in an op-amp change our amplifier design procedure?  
How are output bias points of amplifiers related to the input bias points of the next stage?

How do you change the bias current of a circuit when biasing with current mirrors.

What is a compensation capacitor and why do we use it?

Why is the compensation capacitor wrapped around the gain and level shift stages?

What is slew rate and where does it come from?

What does a slew-rate-limited step response look like?

What does a slew-rate-limited sine wave look like?

What is the value of slew rate for an output limited op-amp, a compensation limited op-amp with a current mirror loaded differential stage, and a compensation limited op-amp with a resistively loaded differential stage?

What is Input common mode range, why does the fact op-amps are used in feedback make us care about it, and what value does our cartoon op-amp have for input common mode range?