

Precision Circuit Design & Amplifier NoiseCircuit errors

- ① Errors in external network components
- ② op-amp (or amp) errors associated w/ input circuitry
- ③ op-amp (or amp) errors associated w/ output circuitry

Component error

→ Problematic e.g. in Differential amplifiers (CMRR), tuned circuits, & filters.

Amplifier input error

- Finite input impedance (not real of a problem)
- Input bias current
- Voltage offset
- CMRR (introduces voltage offset as function of  $\Delta$  level)
- Power supply rejection (PSRR) (Gets worse at higher frequencies)

Amplifier output errors

- Slow rate
- Bandwidth & Settling time  
 (response time  $\rightarrow \tau = \frac{1}{2\pi B}$ )
- Gain error
- Cross-over distortion
- Non-zero output impedance