Transistors (remember?)

- Transistors operate as current amplifiers
- With the right configuration of resistors, we can use them as voltage amplifiers
- We can also use them as switches

But: accurate amplification can be hard: different transistors (even of the same type) can have different gain properties

Operational Amplifiers

- Composed of a set of transistors and other components
- Perform voltage amplification – very accurately
- Use an external feedback loop to control the opamp

Properties of the Ideal Opamp

- Infinite input impedance:
  - Requires no current on the inputs
- Zero output impedance:
  - Can sink/source an infinite amount of current
- Infinite open-loop voltage gain
- Vout = 0 when the two inputs are the same
- Output can change instantaneously

Properties of the Real Opamp

- All of the ideal properties are violated to some degree (but we will assume that they hold for our analysis)
- Also:
  - Vout can never be larger than the positive side of the power supply (10 to 15V is not uncommon)
  - Vout cannot be smaller than the negative side (-10 to -15V)